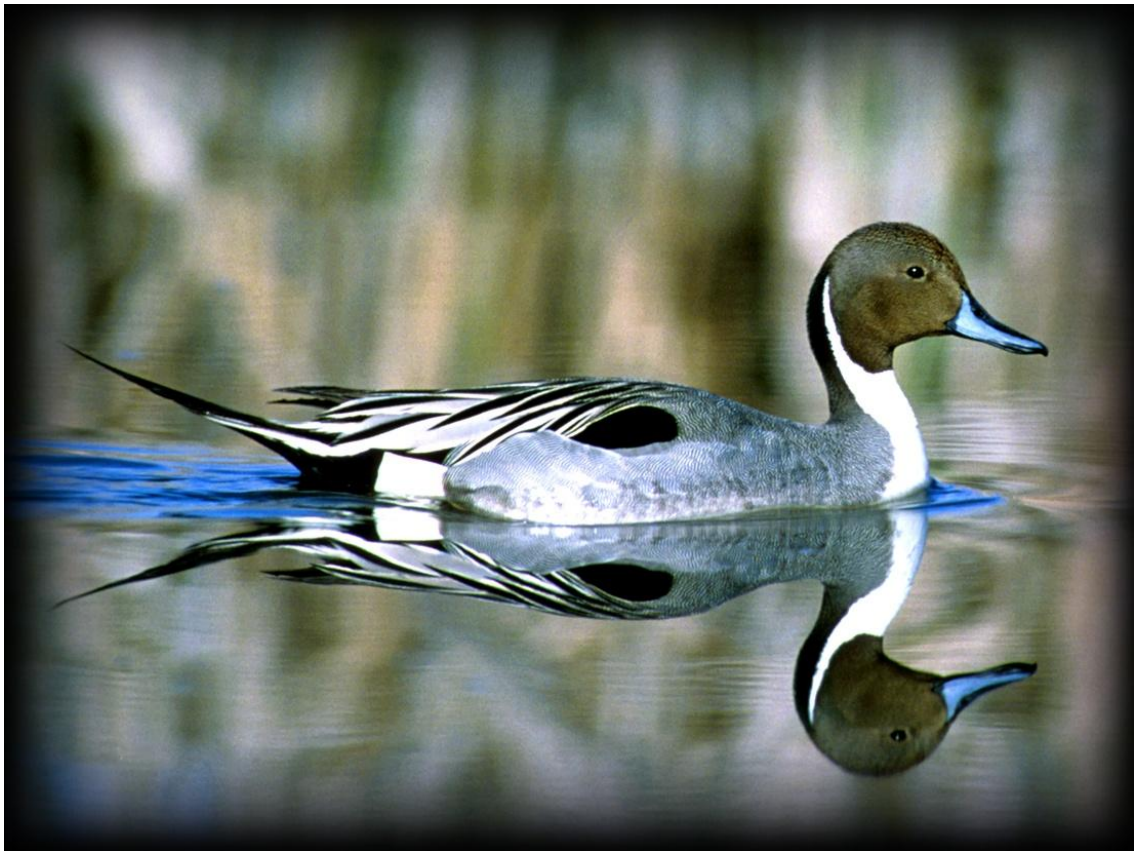
HABITAT MANAGEMENT PLAN FOR
GRAND COTE
NATIONAL WILDLIFE REFUGE

Avoyelles Parish, Louisiana



Northern Pintail
Photo Credit: Dave Menke
USFWS Photo

Southeast Region

Grand Cote National Wildlife Refuge

Habitat Management Plan

U.S. Department of the Interior
Fish and Wildlife Service
Southeast Region

May 2013

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I. Introduction

Throughout the century of its existence, the National Wildlife Refuge System (Refuge System) has established a reputation as premier ground for the refinement of habitat management techniques. Ever since the establishment of Pelican Island National Wildlife Refuge in 1903, refuge employees have taken pride in developing the latest tools for wildlife conservation, often with limited resources. Some of the first examples of rocket nets and airboats, equipment now considered essential for wildlife management, were developed by refuge employees. The first prescribed fire on national wildlife refuge lands was conducted in 1927, at a time when the benefits of this natural process were not well-recognized and most federal agencies still considered fire to have "no place in any forest" (USFS 2004).

As the discipline of wildlife management evolved, largely through the efforts of Aldo Leopold with his publication of *Game Management* in 1933, it was recognized that a greater emphasis needed to be placed on making decisions that are based on the best science of the day, while retaining some of the artful intuition that comes from years of field experience. Sound wildlife management will always involve the skillful integration of science and art in disciplines as diverse as biology and sociology.

Habitat is defined as simply "the physical and biological surroundings of an organism" (Bolen and Robinson 1995). It includes all of the natural components of an ecosystem that are essential for survival including food, cover, and water. The processes that shaped features in central Louisiana, including Grand Cote NWR, are complex and dynamic. This Habitat Management Plan (HMP) was developed to provide a clear, science-based outline for managing the refuge in this challenging environment. To this end, an HMP was developed as a first step in closing the gap between the needs of wildlife and the knowledge of its stewards.

SCOPE AND RATIONALE

HMPs are dynamic working documents that provide refuge managers a decision-making process; guidance for the management of refuge habitat; and long-term vision, continuity, and consistency for habitat management on refuge lands. Each HMP incorporates the role of refuge habitat in international, national, regional, tribal, state, ecosystem, and refuge goals and objectives; guides analysis and selection of specific habitat management strategies to achieve those habitat goals and objectives; and utilizes key data, scientific literature, expert opinion, and staff expertise.

The statutory authority for conducting habitat management planning on national wildlife refuges is derived from the National Wildlife Refuge System Administration Act of 1966 (Administration Act), as amended by the National Wildlife Refuge System Improvement Act of 1997 (Improvement Act), 16 U.S.C. 668dd - 668ee. Section 4(a)(3) of the Improvement Act states: "With respect to the Refuge System, it is the policy of the United States that each refuge shall be managed to fulfill the mission of the Refuge System, as well as the specific purposes for which that refuge was established" and Section 4(a)(4) states: "In administering the Refuge System, the Secretary shall monitor the status and trends of fish, wildlife, and plants in each refuge." The Improvement Act provides the U.S. Fish and Wildlife Service the authority to establish policies, regulations, and guidelines governing habitat management planning within the Refuge System (Service Manual 620 FW 1).

An HMP is a step-down management plan of the refuge's comprehensive conservation plan (CCP). The CCP describes the desired future conditions of a refuge or planning unit and provides long-range guidance and management direction to achieve the purpose(s) of the refuge; helps fulfill the mission of the Refuge System; maintains and, where appropriate, restores the biological integrity, diversity, and environmental health of each refuge and the Refuge System; helps achieve the goals of the National Wilderness Preservation System, if appropriate; and meets other mandates. The CCP for Grand Cote NWR was finalized in 2006 (USFWS 2006).

HMPs comply with all applicable laws, regulations, and policies governing the management of the Refuge System. The lifespan of an HMP is 15 years and parallels that of refuge CCPs. HMPs are reviewed every 5 years, utilizing peer review recommendations, as appropriate, in the HMP revision process or when initiating CCPs. Annual habitat work plans will contain management specifics and are prepared annually.

LEGAL MANDATES

The purposes of a national wildlife refuge, as established by Congress or the Executive Branch, are the primary barometers by which actions on that designated public land are measured. Habitat management, public use, and all other programs are required to fulfill the established purposes of the refuge (CCP USFWS 2006).

Grand Cote NWR Refuge purposes are: "for the development, advancement, management, conservation, and protection of fish and wildlife resources (16 U.S.C. 742f(a)(4); "for the benefit of the United States Fish and Wildlife Service, in performing its activities and services. Such acceptance may be subject to the terms of any restrictive or affirmative covenant, or condition of servitude" (16 U.S.C. 742f(b)(1) (Fish and Wildlife Act of 1956); "the conservation of the wetlands of the Nation in order to maintain the public benefits they provide and to help fulfill international obligations contained in various migratory bird treaties and conventions" (16 U.S.C. 3901(b), 100 Stat. 3583 (Emergency Wetlands Resources Act); "for use as an inviolate sanctuary, or for any other management purpose, for migratory birds" (16 U.S.C. 715d) (Migratory Bird Conservation Act).

In addition to the specific purposes that were established for each refuge, Congress passed the Improvement Act in 1997. This legislation provides clear guidance for the mission of the Refuge System and prioritizes wildlife-dependent public uses. The Improvement Act states that each refuge will:

- Fulfill the mission of the Refuge System;
- Fulfill the individual purposes of each refuge;
- Consider the needs of wildlife first;
- Fulfill requirements of CCP's that are prepared for each unit of the Refuge System;
- Maintain the biological integrity, diversity, and environmental health of the Refuge System; and
- Recognize that wildlife-dependent recreation activities, including hunting, fishing, wildlife observation, wildlife photography, and environmental education and interpretation are legitimate and priority public uses; and allow refuge managers authority to determine compatible public uses.

The following vision statement has been developed for Grand Cote NWR (USFWS 2006):

> Grand Cote NWR will provide critical migration habitat in the Mississippi Alluvial Valley for wintering pintail, mallard, blue-winged teal, wood duck, and other waterfowl species through intensive management of agricultural, moist-soil, and forested wetland habitats. Grand Cote NWR will provide optimal production habitat for wood ducks. Grand Cote NWR will manage fish and wildlife resources to meet local, state, and national goals while promoting compatible wildlife- dependent recreational opportunities.

RELATIONSHIP TO OTHER PLANS

A CCP was finalized for Grand Cote NWR in 2006, which includes goals and objectives for refuge management over a 15-year period (USFWS 2006). The Biological Review Report was instrumental in the development of the CCP (USFWS 2004). The purpose of this HMP is to provide more specific guidance that will facilitate the selection of prescriptions for implementing the goals and objectives of the CCP. In order to establish priorities for managing wildlife and habitats on the refuge, several other planning documents were used in the development of this HMP.

Other plans incorporated in this HMP include the Lower Mississippi River Ecosystem Plan, North American Waterfowl Management Plan, Partners in Flight, U.S. Shorebird Conservation Plan, North American Bird Conservation Initiative and the U.S. Woodcock Plan.

LOWER MISSISSIPPI RIVER ECOSYSTEM PLAN (LMRE)

Grand Cote NWR is part of the LMRE and is considered to be in the West Gulf Coastal Plain Bird Conservation Area (WGCP). As such, the refuge is a component of many regional and ecosystem conservation planning initiatives.

Goals:

1. Conserve, enhance, protect, and monitor migratory bird populations and their habitats in the LMRE.
2. Protect, restore, and manage the wetlands of the LMRE.
3. Protect and/or restore imperiled habitats and viable populations of all threatened, endangered, and candidate species and species of concern in the LMRE.
4. Protect, restore, and manage the fisheries and other aquatic resources historically associated with the wetlands and waters of the LMRE.
5. Restore, manage, and protect national wildlife refuges and national fish hatcheries.
6. Increase public awareness and support for LMRE resources and their management.
7. Enforce natural resource laws.
8. Protect, restore, and enhance water and air quality throughout the LMRE.

NORTH AMERICAN WATERFOWL MANAGEMENT PLAN (NAWMP)

Working under the direction of the NAWMP, the Lower Mississippi Joint Venture (LMVJV) strives to provide habitat for migratory waterfowl in the Mississippi Alluvial Valley (MAV) Bird Conservation Region. The LMVJV assumes that the availability of foraging habitat is the most important factor affecting the number of dabbling ducks that can be accommodated during

winter. Diving duck habitat is not thought to be limiting in WGCP. Based on a step-down process, the LMVJV established habitat objectives that link continental waterfowl populations to on-the-ground habitat objectives. Habitat objectives are apportioned among three categories: public managed; private managed; and natural flooding within each State (in the LMVJV administrative boundaries). By doing so, each NWR (e.g., Grand Cote NWR) is responsible for contributing to some portion of the habitat objectives. Grand Cote NWR provides protection and enhancement of waterfowl habitat for migratory birds wintering on the refuge. The following primary objectives have been developed for this plan.

U.S. SHOREBIRD CONSERVATION PLAN, LOWER MISSISSIPPI/WESTERN GULF COAST

The U.S. Shorebird Conservation Plan is a partnership effort throughout the United States to ensure that stable and self-sustaining populations of shorebird species are restored and protected.

Goals:

1. Develop a scientifically sound monitoring system to provide practical information to researchers and land managers.
2. Identify principles upon which management plans can integrate shorebird habitat conservation with multiple species strategies.
3. Design a strategy for increasing public awareness and information concerning wetlands and shorebirds.

Grand Cote NWR is included in the Lower Mississippi/Western Gulf Coast Shorebird Planning Region and Bird Conservation Region. This plan recommends that public lands provide as much spring shorebird habitat as possible to meet the goal of 520 ha (1,285 acres) of fall habitat in Louisiana. Although step-down objectives have not been created for the WGCP, the following species are considered high priority for the region: piping plover *(Charadrius melodus)*, American golden-plover (*Pluvialis dominica)*, marbled godwit *(Limosa fedoa)*, ruddy turnstone *(Arenaria interpres)*, red knot *(Calidris canutus)*, sanderling *(Calidris alba)*, buff-breasted sandpiper *(Tryngites subruficollis)*, American woodcock *(Scolopax minor)*, and Wilson's phalarope *(Phalaropus tricolor).* These species benefit through the rice coop farming program where 360 acres are shallowly flooded when the rice is planted.

NORTH AMERICAN BIRD CONSERVATION INITIATIVE

Started in 1999, the North American Bird Conservation Initiative is a coalition of government agencies, private organizations, academic institutions, and private industry leaders in the United States, Canada, and Mexico, working to ensure the long-term health of North America's native bird populations by fostering an integrated approach to bird conservation to benefit all birds in all habitats. The four international and national bird initiatives include the NAWMP, Partners in Flight, Waterbird Conservation for the Americas, and the U.S. Shorebird Conservation Plan. The combined effectiveness of these separate programs exceeds the total of their parts.

U.S. WOODCOCK PLAN

The U.S. Woodcock Plan was written by the Service in 1990 to "guide the conservation of woodcock in the United States." Although no step-down plans have been written, the plan gives general guidance for habitat population management at the national level.

STATE WILDLIFE PLAN (LOUISIANA)

The Louisiana State Wildlife Plan formerly known as the Comprehensive Wildlife Conservation Strategy identifies Louisiana as providing refuge for 24 million migratory songbirds on a typical spring day and 5 million waterfowl during an average winter. Additionally, Louisiana lands provide habitat for some 200 rookeries of wading birds and seabirds, some arguably the largest in North America. The Louisiana State Wildlife Plan reviewed the status of all wildlife species known in Louisiana, and has identified 240 species of concern that need specific conservation attention. The list contains 173 vertebrates and 67 invertebrates. The list encompasses both game and non-game species and includes but is not limited to several species know to occur on Grand Cote NWR (e.g., American bald eagle *(Haliaeetus leucocephalus)*, northern pintail *(Anas acuta),* and American woodcock (*Scolopax minor)*. This plan specifically states that take from hunters is not the cause of these declines but habitat loss is the true source. Grand Cote NWR's geographical position in the state combined with its habitat management and restoration efforts allow it to serve as a positive influence in the overall goal of the Louisiana State Wildlife Plan, which is to stop the declines of the species and habitats that are critical to wildlife in Louisiana.

PARTNERS IN FLIGHT – MAV

The Partners in Flight Plan established avian population goals based on bottomland hardwood forest habitat objectives to support source populations of high-priority species of forest breeding birds and lists a habitat objective to maintain or restore >1,500,000 ha of predominately mature, forested wetlands in 101 patches of contiguous forest. This goal comprises 13 patches of >40,000 ha (100,000 acres), 36 patches >8,000 ha (20,000 acres), and 52 patches >4,000 ha (10,000 acres) distributed among 87 Bird Conservation Areas. Due to the relatively small size and fragmented habitats on Grand Cote NWR, there is very little potential to support this plan.

This HMP also incorporates the recommendations of other approved refuge plans including the Fire Management Plan (USFWS 2010) and the Wildlife and Habitat Biological Review Report (USFWS 2004).

II. Background, Inventory, and Description Of Habitat

LOCATION

Grand Cote NWR is in central Louisiana (Figure 1), 10 miles west of the city of Marksville, Louisiana, and 20 miles southeast of the city of Alexandria, Louisiana. The refuge encompasses 6,075 acres in Avoyelles Parish. An additional 6,925 acres of land are included in the approved acquisition boundary of the refuge. Grand Cote NWR is administered as part of the Central Louisiana National Wildlife Refuge Complex, along with Lake Ophelia NWR and Catahoula NWR (Figure 1).

MANAGEMENT UNIT DESCRIPTIONS

The refuge is divided into 39 management units (Figure 2), which function as manageable blocks of forest and waterfowl impoundments. Management objectives will be developed specifically for each unit in this plan. The habitat type, size, soil type, current condition, and past management history for each unit is described in Table 1.

PHYSICAL OR GEOGRAPHIC SETTING

CLIMATE

The climate at Grand Cote NWR is humid subtropical with extended hot, and humid summers and moderately cool winters. The average annual temperature is 65°F, with average summer and winter temperatures of 81°F and 50°F, respectively. Mean annual precipitation is 60 inches, with half of this rainfall (30 inches) occurring between April and September. Average annual snowfall is less than one inch. Grand Cote NWR has a growing season of 235 days, which extends from mid-March to early-November.

TOPOGRAPHY AND HYDROLOGY

Grand Cote NWR lies within the Lower Mississippi River Alluvial Plain (LMRAP) section of the Coastal Plain Province (Beccasio et al. 1983), to the west of the confluence of the Mississippi and Red Rivers in Avoyelles Parish. The topography of the refuge has been greatly influenced by the aggrading Mississippi and Red Rivers. During flood periods prior to human influence, stream channels within the LMRAP overtopped their banks and floodwaters left alluvial deposits across the flooded landscape. The deposits resulted in the formation of natural levees and lowland areas prone to flooding. The formations of alluvium described above comprise the entire land base of Grand Cote NWR. Relict channels and natural levees are often referred to as ridge and swale topography. Human disturbances, including the construction of artificial levees and channelization projects, have drastically altered these natural alluvial processes within the Mississippi and Red Rivers' floodplains.

Grand Cote NWR is a natural sump (Figure 3) that is bordered by the higher ridge lands of the Red River on the north and east and by the terrace uplands on the west and south. The refuge is dissected by two water bodies: Choctaw Bayou and Coulee des Grues. Choctaw Bayou is an outlet for the Chatlain Lake Canal, which provides drainage for the city of

Figure 1. Location of Grand Cote NWR

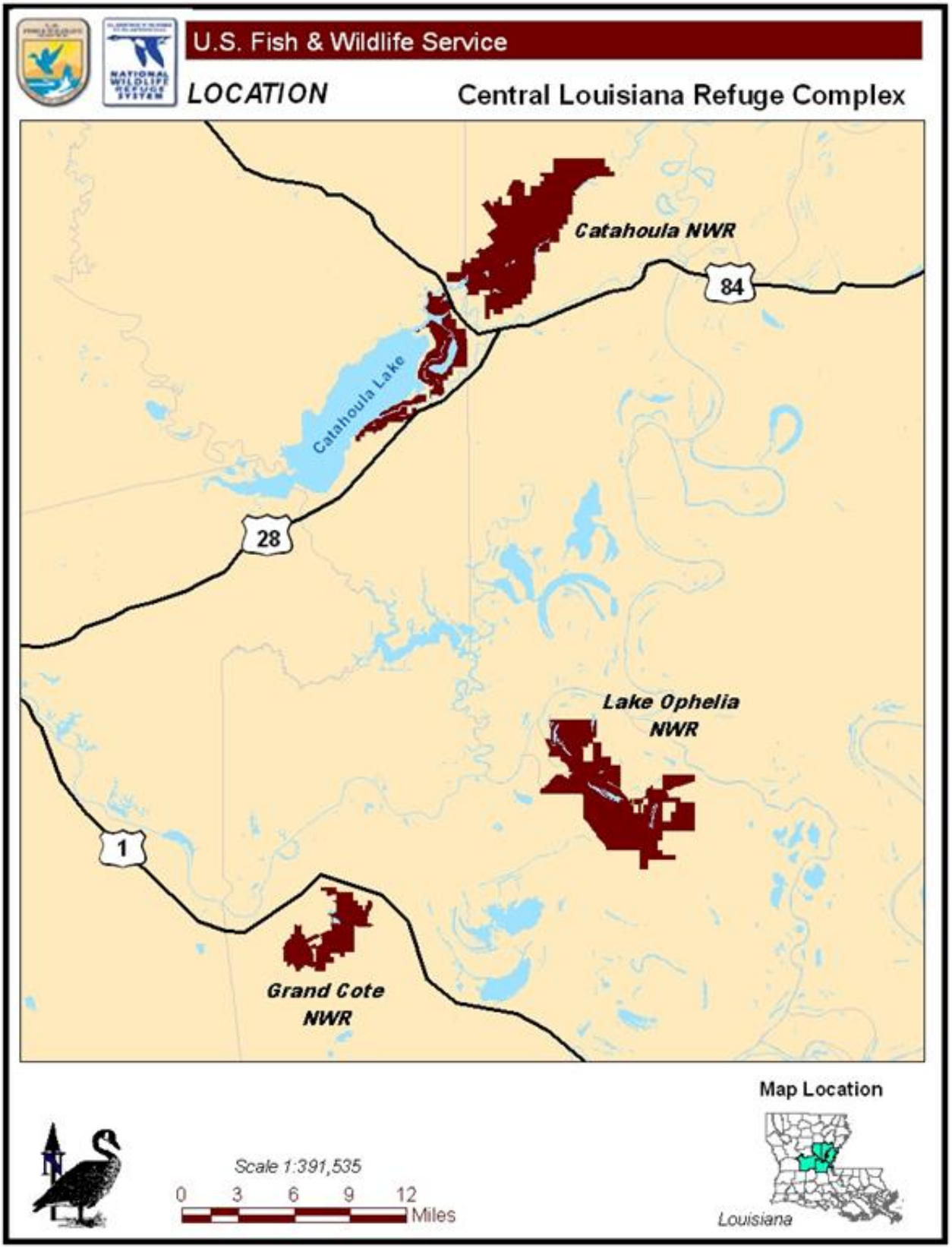


Figure 2. Management units on Grand Cote NWR

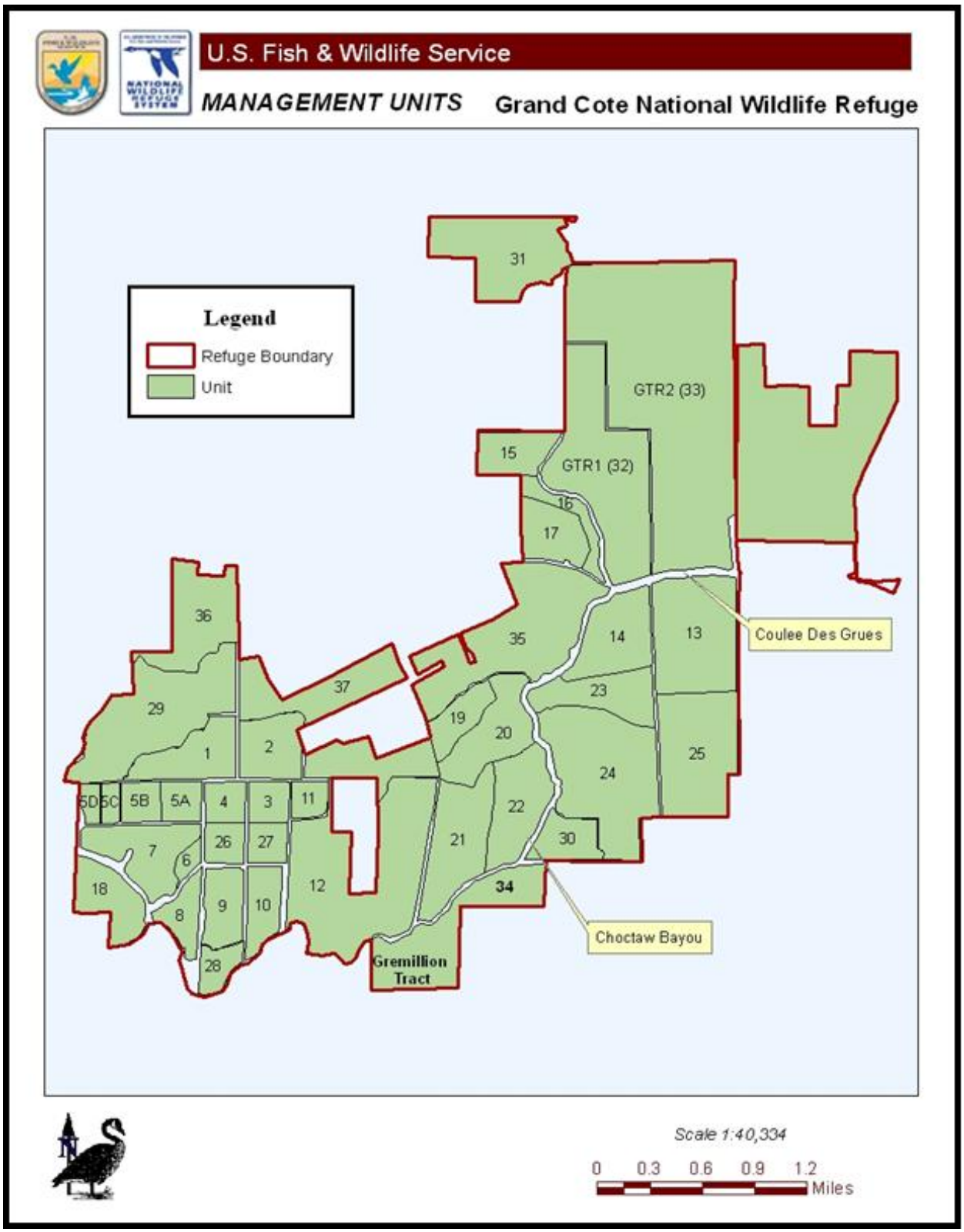


Table 1. Description of 39 management units on Grand Cote NWR

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
1	100	Moreland	Agriculture	100% in rice	1990 – Present unit leveled and farmed in rice each year since 1990
2	85	Moreland	Force Account Farming Agriculture	100% Force Account Farming (milo)	1990- 2007 - Unit managed as moist-soil; 2008 – present, force account farming of corn and milo.
3	35	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
4	35	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
5A	34	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
5B	34	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
5C	16	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
5D	16	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
6	15	Moreland	Moist Soil	Moist-soil vegetation with water control capability.	1990-2008 agriculture, 2009-2010 reforested
7	110	Moreland	Reforestation	Trees planted in 2010	1990-2008 agriculture, 2009-2010 reforested

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
8	43	Moreland	Reforestation	Trees planted in 2010	1990-2008 ariculture, 2009-2010 reforested
9	64	Moreland	Agriculture	100% Force Account Farming (milo)	1990- 2007 Unit managed as moist soil until 2008 – Present force account corn and milo.
10	56	Moreland	Agriculture	100% Force Account Farming (milo)	1990- 2007 managed as moist soil-unit until 2008 – Present force account corn and milo.
11	27	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
12	251	Moreland	Forested Wetland	100% Natural Regeneration/Moist Soil	None
13	200	Moreland, Latanier	Agriculture	100% in mlo	1990-2009 unit farmed in soybeans/milo. 2010 – moist soil
14	117	Moreland, Latanier	Agriculture	100% in milo	1990-2009 unit farmed in soybeans/milo. 2010 – moist soil

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
15	65	Moreland, Loring	Moist Soil	Moist soil vegetation with water control capability; can pump and hold water; can dewater only when Bayou Choctaw is not flooded.	Rotate every 1-2 years with agriculture crop.
16	39	Moreland	Moist Soil	Moist-soil vegetation with water control capability; can pump and hold water; can dewater only when Bayou Choctaw is not flooded.	Rotate every 1-2 years with agriculture crop.
17	75	Moreland	Moist Soil	Moist-soil vegetation with water control capability; can pump and hold water; can dewater only when Bayou Choctaw is not flooded.	Rotate every 1-2 years with agriculture crop.
18	189	Moreland	Moist Soil	Moist-soil vegetation with water control capability; can hold water, but only pull water off when Bayou Choctaw is not flooded.	Rotate plowing of entire unit every 3 years.
19	53	Moreland	Force Account Farming Agriculture	100% Force Account Farming-milo	1990-2007 moist soil, 2008-Present Force account farmed in milo.

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
20	113	Moreland	Force Account Farming Agriculture	100% Force Account Farming-milo	1990-2007 moist soil, 2008-Present Force account farmed in milo.
21	147	Moreland	Force Account Farming Agriculture	100% Force Account Farming-milo	1990-2008 moist soil, 2009-Force account farming Present – moist soil.
22	118	Moreland	Force Account Farming Agriculture	100% Force Account Farming-milo	1990-2008 Moist Soil, 2009-Present Force Account Farming in milo.
23	95	Moreland, Latanier	Agriculture	100% milo	1990-2009 agriculture 2010 – moist soil
24	272	Moreland, Latanier	Moist Soil	60% black willow, 40% moist soil	1990-Present – moist soil
25	196	Moreland, Latanier	Greentree Reservoir	80% black willow, 20% moist soil	1990-Present – semi-permanent forested wetland habitat. Remain flooded for three consecutive years with summer draw-down during third year. Important for wood duck production.

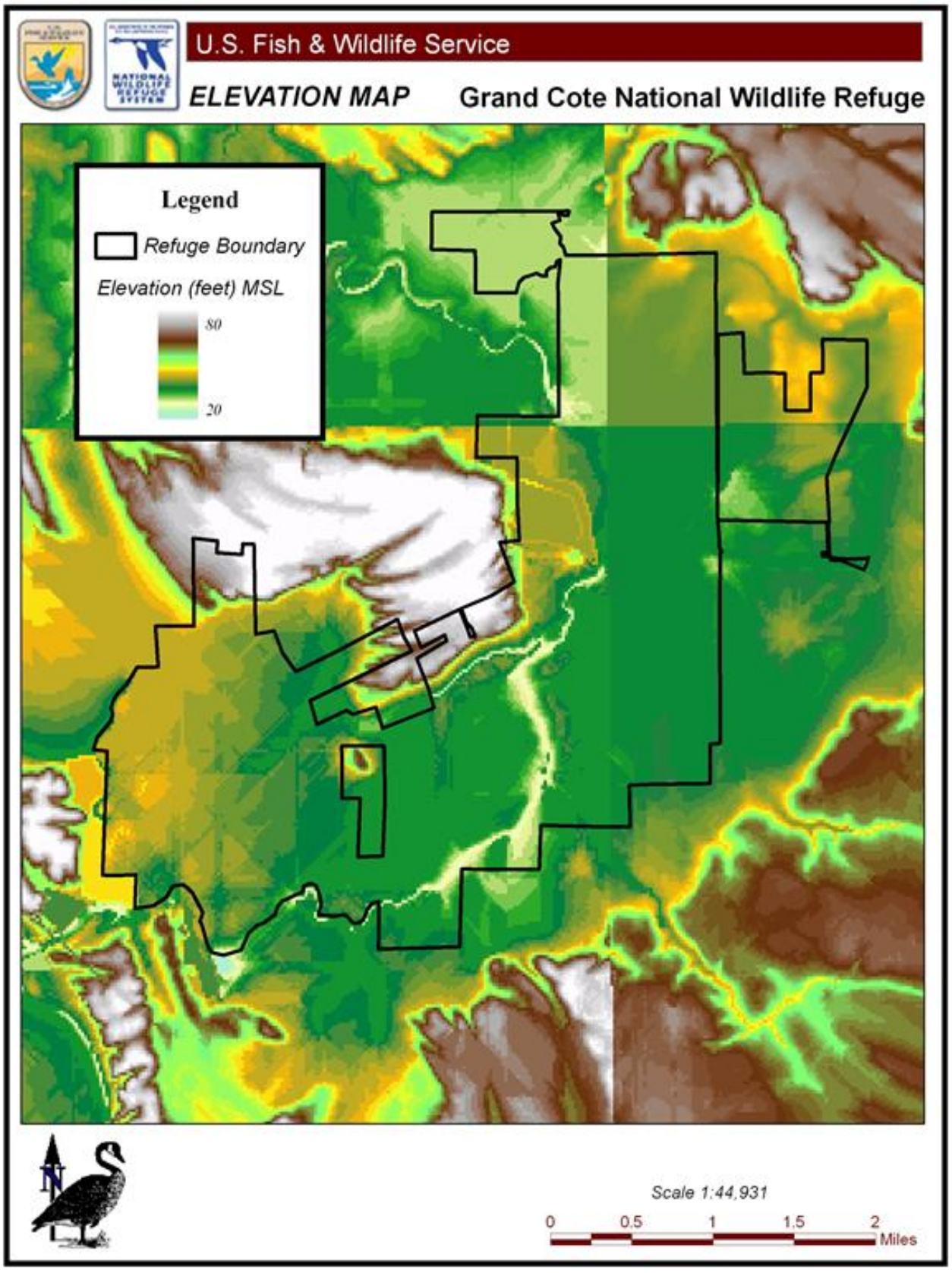
Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
26	33	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
27	33	Moreland	Agriculture	100% in rice	1990-Present unit leveled and farmed in rice.
28	34	Moreland	Reforestation	Trees planted in 2010	1990-2006 agriculture, 2007-2010 reforested
29	238	Moreland	Reforestation	Trees planted in 2010	1990-2008 ariculture, 2009-2010 reforested
30	80	Moreland	Moist Soil	100% moist soil	None-Land being acquired by exchange.
31	240	Latanier, Moreland, Solier	Natural Regeneration	80% green ash/hackberry, 20% black willow	None
32-GTR 1	288	Moreland, Latanier, Norwood, Loring	Greentree Reservoir	90% Nuttall, water, and willow oak-10% black willow	1989 - Direct Seeded by refuge staff with Nuttall, water, and willow Oak species. This unit is managed as a greentree reservoir.
33-GTR 2	739	Moreland, Latanier, Loring, Gore	Greentree Reservoir	90% Nuttall, water, and willow oak-10% black willow	1989 Direct seeded by refuge staff with Nuttall, water, and willow oak species. This unit is managed as a greentree reservoir.

Management Unit	Size (ac)	Soil Type	Habitat Type	Current Condition	Treatment History
34	77	Moreland	Natural Regeneration	80% green ash/hackberry, 20% black willow	None
Gremillion	100	Moreland	Moist soil	90% moist soil, 10% willow	Rehabilitated in 2010 and managed for moist soil.
35	273	Moreland, Loring, McKamie, Solier, Gore, Calhoun	Upland Forest	Consists of Loblolly pine and Chinese Tallow	None
36	185	Moreland, Loring, Calhoun, Memphis, Gore, Coteau,	Bottomland Hardwood Forest	Consists of 30% loblolly pine and 70% green ash, oak, and hackberry mix	None
37	131	Moreland, Calhoun, Gore, Loring	Upland/Pine	Consists of loblolly pine and Chinese tallow	None

Alexandria and other areas north of the refuge. During significant rainfall events, water from the Chatlain Lake Canal causes backwater flooding on the refuge via Choctaw Bayou and Coulee des Grues.

Prior to refuge establishment, the land was intensively farmed and a series of man-made levees, irrigation ditches, pumps, and water control structures were constructed to facilitate farming. Most of these features still occur on the refuge and are currently used to manage water levels within impoundments for waterfowl and shorebirds. While these structures have altered the area's natural hydrology, removal or modification of structures to restore the natural hydrologic regime could impact other refuge management, such as cooperative farming for waterfowl, shorebird, and wading bird management. Other alterations to the current hydrology include laser land leveling on some cooperatively farmed fields, which produces uniform topography.

Figure 3. Elevations on Grand Cote NWR



HISTORIC HABITAT CONDITIONS

History of Refuge Lands

The purpose of habitat management is often to restore an area to the historical conditions that were present before the land was substantially altered by European settlement. Most habitat loss in central Louisiana occurred within the last 100 years when agriculture and development, especially in the past 40 years, increased. There are other human effects on the environment that are less conspicuous than development and clearing, but can result in severe degradation of habitat. For example, alterations to the natural hydrology, such as levees, channelization of rivers, locks and dams, etc., have severe negative effects on bottomland hardwood systems and other wetlands. Although such factors do not cause the dramatic die-off of animals that can be readily observed, the subsequent gradual shifts in habitat and downward trend in wildlife reproduction can result in the extirpation of a species from its native range.

In order to define objectives for habitat management on the refuge, a substantial effort was made to determine the historical condition of refuge lands and their surrounding areas. Plan development involved extensive research utilizing refuge documents, external literature, and personal communications.

Cultural and Refuge Land History

Grand Cote NWR is located within Avoyelles Parish, which received its name from the tribe of Avoyelles Indians that resided there prior to European settlement. The first European settlers to arrive in Avoyelles Parish were French. They settled the prairie land and were primarily self-sufficient with plentiful game, fish, livestock, and food (e.g., corn, rice, and fruit) and cash crops (e.g., indigo and tobacco). Around 1780, the area became known as Avoyelles Post. Areas along streams were settled later, where the land was very fertile and the streams provided a means of transportation. In the early 1800s, cotton began to replace indigo as the main money crop. At this time, cotton was primarily grown on small farms in the highlands. In 1815, the first steamboat navigated up the Red River, and by 1875, there were 52 boats traveling the river to transport goods.

The area has always had an abundance of fish and game, due to its diversity of lands and waters. As early as 1939, a sportsmen's club was created for the purpose of protecting game and wildlife in Avoyelles Parish (Saucier 1943).

Clearing of mature bottomland hardwoods for agriculture began in the late 1960s on what was to become Grand Cote NWR. To facilitate drainage, a system of levees was subsequently constructed. In addition to the loss of forested wetlands, there have been significant alterations in the region's hydrology due to urban development, river channel modification, flood control levees, reservoirs, and deforestation. The refuge was established in 1989 under the authority of the Fish and Wildlife Act of 1956 [16 U.S.C. 742f (a)(4)], the Emergency Wetlands Resources Act of 1986 (16 U.S.C. 3901(b), 100 Stat. 3583), and the Migratory Bird Conservation Act as amended in 1989 (U.S.C. 715d).

Pre-European Settlement Conditions

Bottomlands

Prior to settlement, the LMRAP was a 25-million-acre forested wetland complex that extended along both sides of the Mississippi River from Illinois to Louisiana.

Bottomlands in central Louisiana consisted of bottomland hardwood forest, baldcypress/tupelo swamps, sloughs, forested and emergent lakes, ponds, rivers, and bayous. Because rivers, bayous, and lakes are not generally managed, this section will focus on bottomland hardwood forests.

As stated in the Desired Forest Conditions Report to the LMVJV (2007), bottomland hardwood systems are described as among the most productive and diverse ecosystems in North America (Klimas et al. 2004). They are maintained by the natural hydrologic regime of alternating wet and dry periods and historically these forests served as an integrated system linked by flood waters to import, store, cycle and export nutrients (Wharton et al. 1982, Klimas et al. 2004). These bottomland hardwood forests contain a diversity of overstory species, are characteristically rich in woody vines and shrubs, and may feature an understory with large monocots, such as cane (*Arundinaria gigantea*) and palmetto (*Sabal minor*) (Wharton et al. 1982, Klimas et al. 2004, Gardiner and Oliver 2005). Natural regeneration within bottomland hardwood stands is typically initiated by localized damage to overstory trees, such as single tree snapping or wind throw (Johnson and Deen 1993, King and Antrobus 2001), periodic catastrophic fire, windstorm damage, or prolonged growing season flood water (Dickson 1991).

These forests are forested wetlands that are found along rivers and streams. Bottomland hardwood forest composition was historically driven by hydrology. Even subtle changes in elevation are reflected in the native plant community.

The extent of impact on bottomland forests by Native Americans has long been disputed. Although Native Americans had altered the forest somewhat, many European explorers, such as Bartram and Nuttall, described the area as having vast tracts of pristine, untouched forest. Generally, these forests remained intact wilderness until Europeans began changing the hydrology and changing the structure of the landscape with practices like draining sites for agriculture and timber harvest.

Forested Uplands

Uplands were typically forested with either pines, hardwoods, or a mixture of these trees. As elevation decreased, the hardwood component of these forests increased, as is seen in bottomland hardwood forests. Forested upland sites are very limited in extent on Grand Cote NWR. There is a small amount of forested upland sites off or adjacent to the refuge. These uplands have been drastically altered and degraded by conversion to off-site pines and invasion by nonnative invasive vegetation, including the Chinese tallow tree *(Triadica sebifera)* and Chinese privet *(Ligustrum sinense)*.

Moist Soil

Prior to European settlement, moist-soil habitats on Grand Cote NWR were intact mature bottomland hardwood forests with the same characteristics as described in the previous section titled “Bottomlands,” Moist-soil habitats were historically found in areas where openings were created from natural disturbances, such as periodic catastrophic fire, windstorm damage, or prolonged growing season floodwaters.

CURRENT HABITAT CONDITIONS AND TYPES

Soils

The following is a listing and description of the soil series and association occurring on the refuge (Figure 4) according to the U.S Department of Agriculture, Soil Conservation Service, as described in the *Soil Survey of Avoyelles Parish, Louisiana* (1986). The soils on the refuge demonstrate the influence that the Mississippi and Red Rivers have had on the terrain. The refuge contains mostly hydric soils (Figure 4).

Calhoun Series

Calhoun silt loam (Ca).

This Calhoun soil is moderately well-suited to cultivated crops and well-suited to woodlands. Crops and woodlands are limited by wetness in the spring and droughtiness in the summer and fall. Equipment use should be limited periods of dry conditions.

Coteau Series

Coteau silt loam, 1 to 3 percent slopes (Cv).

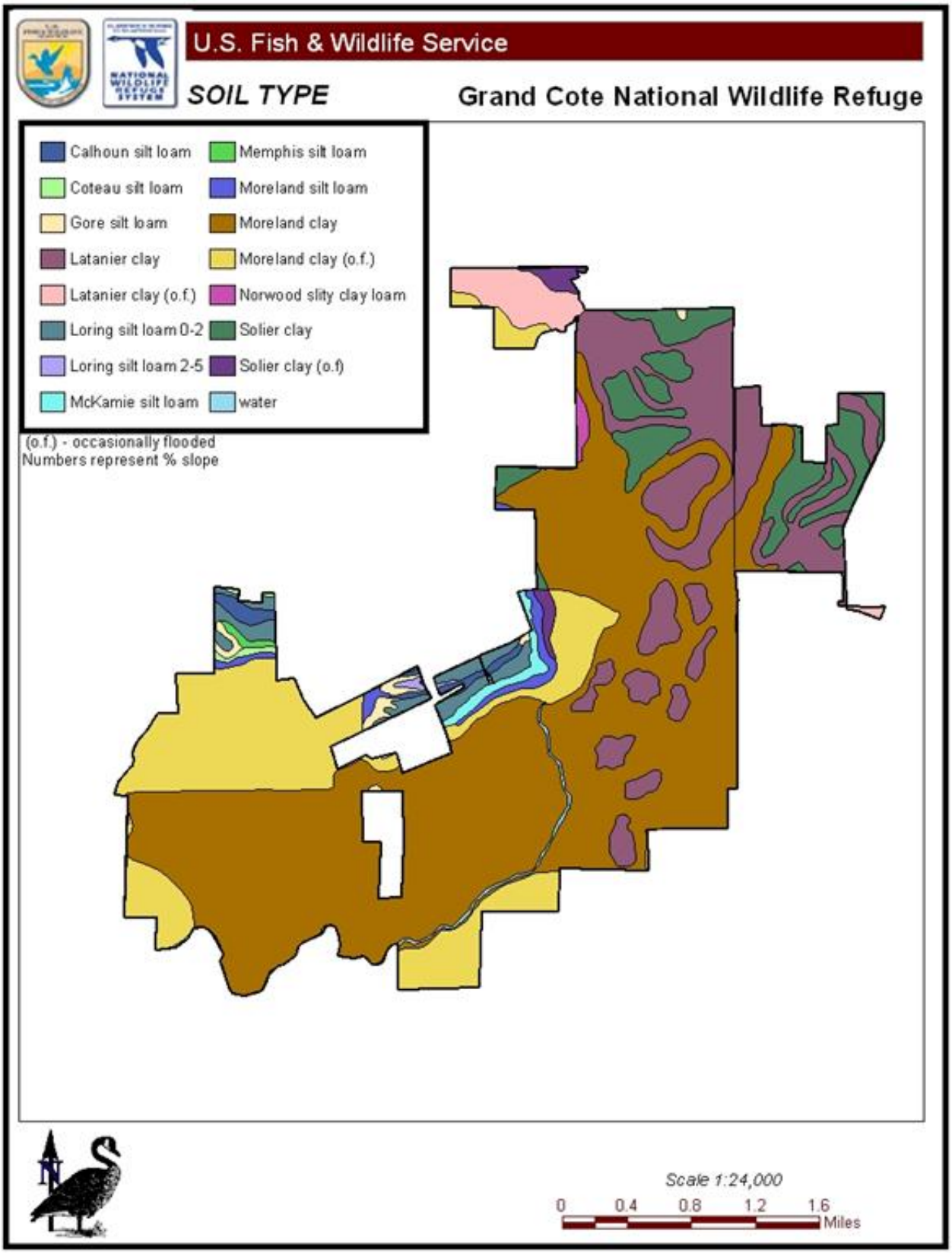
This Coteau soil is well-suited to cultivated crops. Limitations include droughtiness, moderate erosion hazard, and toxic levels of exchangeable aluminum in the subsoil. This soil is also well-suited to production of loblolly pine; however, wetness limits equipment access somewhat.

Gore Series

Gore silt loam, 1 to 5 percent slopes (Gr).

This soil is poorly suited to cultivated crops and moderately well-suited to production of commercial pines. Crops are limited by droughtiness, short and irregular slopes, toxic levels of exchangeable aluminum, and a severe erosion hazard. Loblolly and shortleaf pines do well on this soil with a site index of 75 to 80 for loblolly pine. Limitations include wetness and erosion hazard.

Figure 4. Soil types on Grand Cote NWR



Latanier Series

Latanier clay (La) AND Latanier clay, occasionally flooded (Ln).

Both of these Latanier soils have high fertility and are moderately suited to well-suited for cultivation of crops and southern hardwoods. However, surface water runoff is slow and water persists in low areas. Land use is limited by wetness and only trees that can tolerate seasonal wetness should be planted.

Loring Series

Loring silt loam, 0 to 2 percent slopes (Lo) and Loring silt loam, 2 to 5 percent slopes (Lr).

Both of the above Loring silt loam soils are well-suited to cultivated crops and woodlands. Plant growth is primarily limited by droughtiness and the dense, acidic fragipan. Loring silt loam with a 2 to 5 percent slope has a moderate erosion hazard.

McKamie Series

McKamie silt loam, 5 to 12 percent slopes (Ma).

This soil has low natural fertility with medium to strong acidity and high shrink-swell capacity. Runoff is rapid and erosion is a severe threat. This soil is primarily forested, which is limited by the clayey subsoil, gullies, and erosion. McKamie soil is poorly suited to cultivated crops and is limited by short, complex slopes; a severe erosion hazard; droughtiness; and toxic levels of exchangeable aluminum.

Memphis Series

Memphis silt loam, 8 to 20 percent slopes (Mm).

This is a moderately steep, well-drained soil on the escarpment between the terrace uplands and the alluvial plain and along major entrenched drainage-ways in the terrace uplands. Memphis silt loam soils are well-suited to production of commercial pines and hardwoods. The soil is poorly suited to cultivated corps and is limited by short, complex slopes, a severe erosion hazard, and droughtiness.

Moreland Series

Moreland silt loam (Mo).

This is a level, somewhat poorly drained soil in low positions on the natural levees of the Red River and its tributaries. The surface layer is reddish-brown silt loam about 10 inches thick. The subsoil is dark reddish-brown and reddish-brown silty clay. This soil is mildly to moderately alkaline with a high fertility. Shrink-swell potential is very high.

Moreland clay (Ms).

This is a level, somewhat poorly drained soil found in low areas along natural levees of the Red River and its tributaries. The surface layer is dark reddish-brown clay up to a depth of 60 inches. Some areas have gray or grayish-brown silt loam, silty clay loam, or clay below. This soil is neutral to moderately alkaline and highly fertile. Shrink-swell potential is very high.

Moreland Silt loam (Mo) and Moreland clay, occasionally flooded (Mt).

These Moreland soils are all well-suited to cultivation. Mo is a level somewhat poorly drained soil in low positions on the natural levees of the Red River and its tributaries. This soil is mildly to moderately alkaline with a high fertility. The Moreland clays (Ms, Mt) are well-suited for woodlands, while the silt loam is well-suited to southern hardwood production. Ms is a level somewhat poorly drained soil in low areas along natural levees of the Red River and its tributaries. Trees should be water tolerant and equipment use should be limited to dry periods.

Norwood Series

Norwood silty clay loam (Nr).

This is a level, well-drained soil in intermediate positions on the natural levees of the Red River and its tributaries. This Norwood soil is well-suited for cultivation and woodland. Land use is limited by wetness, but has a high production potential for native hardwoods.

Solier Series

Solier clay (So) and Solier clay occasionally flooded (Sr).

These are level, poorly drained soils on low stream terraces; however, So has an irregular distribution. Solier soils are well-suited to cultivated crops and production of southern hardwoods or woodlands. Trees must be adaptable to wet conditions as runoff is slow and occasional flooding occurs. Land use is limited by wetness, flooding, and poor tilth.

Geomorphology

Grand Cote NWR is located within the LMRAP section of the Coastal Plain Province (Beccasio et al. 1983), to the west of the confluence of the Mississippi and Red Rivers in Avoyelles Parish. These rivers have influenced much of the landscape over the past 300,000 years (Jones and Shuman 1989; Saucier 1994). The topography of the refuge and much of the geology is from Quaternary (1.8 million years ago to present) alluvial deposits. During flood periods prior to human influence, stream channels within the MAV overtopped and spilled onto adjacent floodplains. As the velocity of these waters decreased rapidly, the coarsest particles were deposited closest to the stream channel and the finer particles were deposited farther away. These deposits formed natural levees, which gained elevation closer to the river channel. Such deposits also created lowlands at the foot of natural levees which meander parallel to streams. These alluvium formations comprise the entire Grand Cote NWR. Relict channels and natural levees are often referred to as ridge and swale topography. Human disturbances, including the construction of artificial levees and channelization projects, have drastically altered these natural alluvial processes within the Mississippi and Red Rivers' floodplains.

Habitat Types

The refuge consists of a mix of habitat types (Figure 5), including small remnant pieces of mature bottomland hardwood forests, reforested areas, upland hardwood forests, moist-soil habitats, and cropland habitats.

The refuge currently consists of approximately 40 acres of remnant bottomland hardwood forests, 1,350 acres of naturally regenerated hardwood forests, 1,650 acres of reforestation, 400 acres of upland forest, 1,450 acres of cropland impoundments, 650 acres of moist-soil impoundments, and 500 acres of bayous, levees, roads, parking, and facilities.

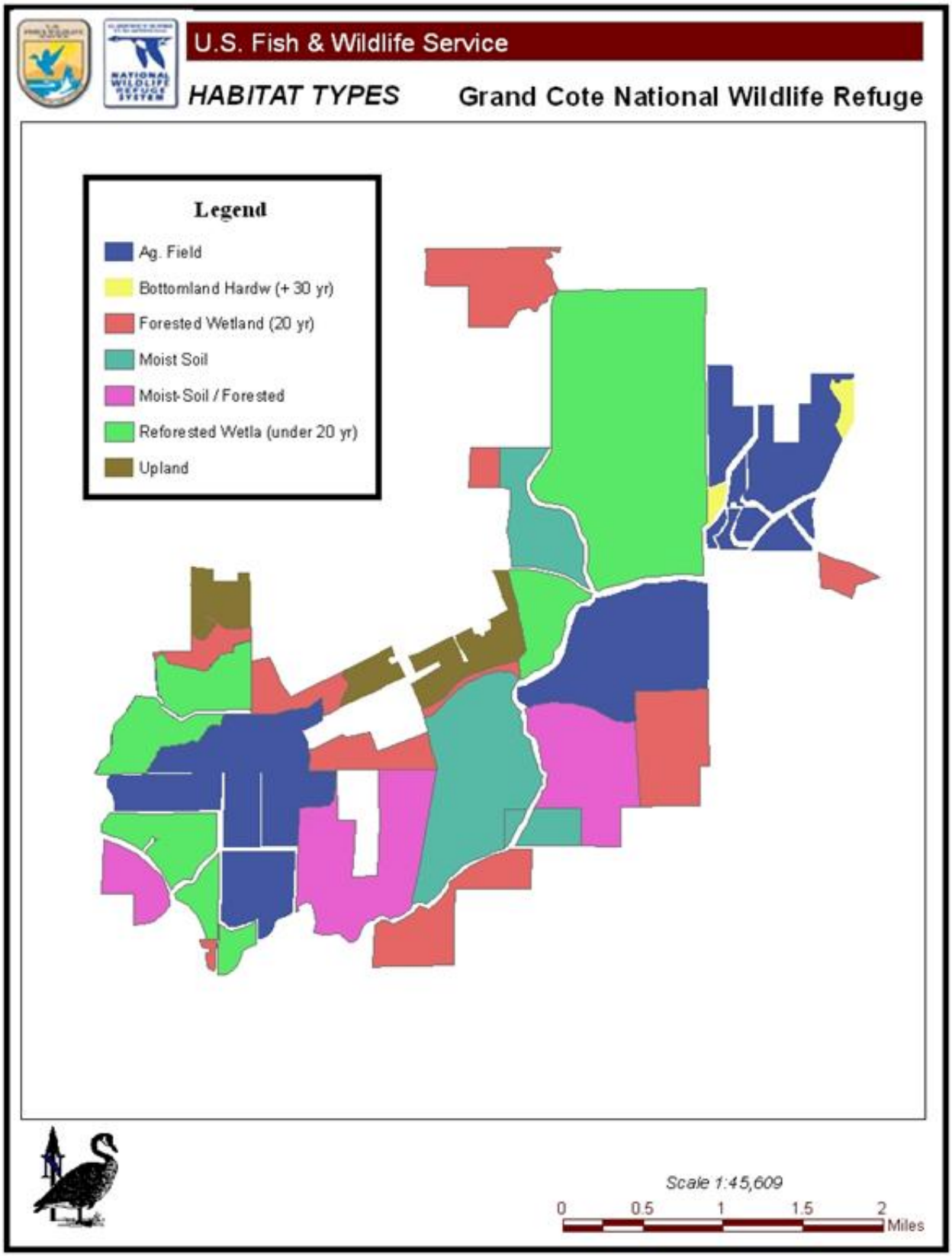
Bottomland Hardwood Forests

As described in the refuge history, the bottomland hardwood forests on Grand Cote NWR have been reduced significantly due to clearing of land for agriculture. Mature bottomland hardwood forests only remain in a few remnant tracts totaling approximately 40 acres. Approximately 908 acres of hardwood forest habitats have become established through natural succession following the acquisition of the refuge.

Active restoration of forested wetland habitats has included direct seeding and planting of seedlings. The first projects were completed in 1989 and 1990, when refuge staff machine-planted a total of 1,186 acres. In 1989, 362 acres were direct-seeded with acorns--92 acres south of Little California Road and 270 acres north of the road, east of the crawfish ponds (Units 15-17), and west of Choctaw Bayou. Of that, 282 acres were planted with Nuttall oak *(Quercus texana)* at 6.75 pounds per acre and 80 acres were planted with water (Quercus *nigra*) and willow oak *(Quercus phellos)* at 2.40 pounds per acre. The following year, 705 acres were planted, with 216 acres planted in the spring north of Little California Road and 489 acres planted in the fall, north of the spring planting. All acres were planted with water and willow oak acorns at a rate of 4.6 pounds per acre in the spring and 5.5 pounds per acre in the fall. Survival plots were established to monitor seedling success, which was very high in the first year with 0 percent mortality on all plots. Mortality observed in later years warranted the replanting of several hundred acres at Grand Cote NWR in 1995. Impounded reforested sites are currently managed as greentree reservoir (GTRs) units 32 and 33 and subjected to seasonal flooding for waterfowl habitat. Refuge staff also hand planted 8 acres of pecan seedlings on drier sites.

These reforested units were previously croplands bounded by levees to protect from flooding. The existing levees and water control structures were refurbished to function as a GTR. In 2009, all the water control structures within the GTRs were replaced. The refuge partnered with Ducks Unlimited to install a 36-inch low-lift pump in Coulee Des Grues, to enable the refuge the ability to flood these GTRs. In previous years, the refuge did not have the ability to flood/hold water, because the old structures were rusted out and could not hold water. The current water management regime for the GTRs annually floods the units in late November by utilizing the existing low-lift pump or capturing rain/flood water. Draw-downs occur in mid- to late-February. Moderate fluctuations of water levels within the GTR are allowed to occur throughout the flooding periods to mimic natural cycles. Water depths of 6 to 18 inches are targeted to provide optimum foraging conditions for waterfowl. Additionally, one out of every 3 to 5 years allows that no flooding occurs in order to maintain the health, integrity, and composition of the forested units.

Figure 5. Habitat types on Grand Cote NWR



In January 2010, a second reforestation project was completed. Contracted machine planters planted a total of 436 acres (Units 7, 8, 28, and 29) using a 12-foot spacing between rows and individual trees. A pre-emergent herbicide, Sulfometuron-methyl, was applied at the time of planting to reduce competition of weedy vegetation around seedlings. Seventeen species of trees native to Louisiana's bottomland hardwood forests were planted on sites which were previously cleared for agriculture and left fallow one to two years prior to planting. Plantings were mixed at a ratio of 50:50 hard and soft mast producing species. Hard mast producing species include Nuttall oak, Shumard oak *(Quercus shumardii)*, cherrybark oak *(Quercus pagoda)*, water oak, willow oak, swamp chestnut oak *(Quercus michauxii)*, overcup oak (*Quercus lyrata*), sweet pecan (*Carya illinoensis)*, and water hickory *(Carya aquatica)*. Soft mast producing species include sweetgum *(Liquidambar styraciflua)*, green ash *(Fraxinus pennsylvanica)*, sugarberry *(Celtis laevigata)*, red maple *(Acer rubrum)*, persimmon *(Diospyros virginiana)*, red mulberry *(Morus rubra)*, sycamore *(Platanus occidentalis)*, and blackgum *(Nyssa sylvatica)*. Success of these plantings will be monitored in the first year and then as needed by counting the proportion of live trees within square plots, each containing 100 marked live seedlings at the time of planting. Four survival plots were placed within the planted units at Grand Cote NWR in 2010.

Reforested bottomlands will provide additional food and cover resources for a variety of wildlife. However, the area surrounding the refuge has been mostly cleared for agriculture and the small amount of bottomland hardwood forest that exists in and around the refuge is not large enough to support source populations of neotropical migratory birds. Even if completely reforested, the refuge would only meet minimum criteria to support most priority forest-associated bird species.

Reforestation efforts have been possible because of refuge staff and cooperation with other organizations. Although tree planting and direct seeding have been successful and contributed to the conservation of habitat, management beyond the initial planting stage is not expected due to the lack of a refuge forester, forestry technician, or sufficient resources within the Central Louisiana NWR Complex.

Forested Uplands

The refuge currently has 286 acres of upland forest. This habitat type is limited to the area surrounding the Complex office and has had little to no management. Stands are dominated by off-site pine and nonnative species including the Chinese tallow tree. These stands contain very few endemic hardwood species. Lack of data and management on uplands is attributed to having no refuge forester within the Central Louisiana NWR Complex.

Waterfowl Impoundments – Cropland

The refuge currently contains about 1,400 acres of impoundments where agricultural crops are annually planted to provide food resources for wintering waterfowl. These acres are managed under a cooperative farming program, currently yielding approximately 280 acres in un-harvested crops for wildlife. Additionally, there are approximately 300 acres of un-harvested crops planted by refuge staff. To manage the cropland program more efficiently, the refuge is divided into two farm units. This division is along Choctaw Bayou, which divides the refuge into East Farm and West Farm units. Within these units, cooperative farmers operate within distinct boundaries. The West Farm Unit is located west of Choctaw Bayou and the East Farm Unit is located east of the bayou.

The refuge has been planting milo, rice, and corn. The cooperative farmers usually plant a particular crop, such as milo, and then rotate that crop every 2 to 3 years. The reason this practice is done is to keep the soil conditions within balance (i.e., put organic matter back into soil). If the same crop is planted year after year, the soil becomes poor, which, in turn, affects the crop production/yield. The rice units are rotated with corn to help put organic matter back in the soil and allow for control of red rice. In the event that an undesirable plant or weed species becomes problematic, then as a last resort, soybeans may be planted to reduce the proliferation of that species.

West Farm Unit

The West Farm Unit consists of approximately 560 acres and includes milo, corn, and rice. These crop types are grown annually, and farmers are restricted to planting only waterfowl food (e.g., corn, milo, and rice). Services in the West Farm Unit have been targeted at improving water management efficiency and increasing rice/moist-soil production. Since 1998, about 160 acres have been laser-leveled, and deferred maintenance allocations have provided for the drilling of two irrigation wells. Future improvements could include enhancing rice, moist-soil production, and water management capabilities by leveling more ground, cleaning ditches, and installing underground pipe for more efficient water conveyance.

East Farm Unit

The East Farm Unit consists of approximately 840 acres and includes milo and soybeans. Currently, there is no rice production in the East Farm Unit. The East Farm Unit is not flat or level enough for growing rice. Leveling this unit is cost-prohibitive. Services in this unit have been targeted at setting back vegetative succession for increasing moist-soil production and planting millet. Approximately 90 acres have been cleaned up and are planted to millet annually. Future improvements options include: (1) Enhancing rice and moist-soil production and water management capability south of Little California Road; and (2) establishing water management through delivery and drainage north of Little California Road.

Waterfowl Impoundments-Moist Soil

The timing of drawdown in waterfowl impoundments on Grand Cote NWR to propagate moist-soil plants has ranged from mid-May to late-June, to maximize sprangletop (*Leptochloa spp*.), panic grass (*Panicum spp*.), and wild millet (*Echinochloa spp*.) production. Water depth in the surrounding bayou/coulee is another factor that determines the drawdown schedules. Most drawdowns conducted are considered slow, at approximately 3 inches per week.

Some common desirable moist-soil plants found in impoundments on the refuge are sprangletop, red-rooted sedge (*Cyperus erythrorhizos*), panic grass, and wild millet. Estimated pounds/acre of seeds for these moist-soil plants (Kross 2006) have ranged from 496 to 530 kg/ha in moist-soil sites on the refuge during 2002 and 2003. Red vine *(Brunnichia cirrhosa)*, alligator weed *(Alternanthera philoxeroides)*, coffeeweed *(Sesbania sp.)*, trumpet creeper *(Campsis radicans)*, cocklebur *(Xanthium sp.)*, button bush *(Cephalanthus occidentalis)*, and willow *(Salix sp.)* trees are some common nuisance plants found in moist-soil units on the refuge. Disking, flooding, and applying herbicides are common practices used when nuisance plants become a problem. Generally, units are disked and planted in millet at least once every 3 years for nuisance plant control and to set-back natural succession.

Levees and water control structures allow for water-level manipulation in the moist-soil units. Additionally, an electric irrigation well was installed in 2009 and now provides a means of flooding units 15, 16, and 17. Fall flooding for wintering waterfowl, in a typical year, begins around early November to December and is somewhat rainfall-dependent. Impoundments are generally flooded to full capacity during this time, making food available to waterfowl. Moist-soil impoundments are generally de-watered during late May to early June. Water is removed slowly in order to conserve nutrients and concentrate invertebrates for wading birds and other wildlife.

HABITAT CHANGES FROM HISTORIC TO CURRENT CONDITION

Prior to acquisition by the Service, refuge lands were privately owned by multiple landowners. Land-use practices were predominantly agriculture, which resulted in deforestation of Grand Cote NWR and surrounding lands during the 1960s and 1970s. As the land was cleared, extensive levees were constructed to protect farm fields from flooding. These levees are still used to protect farm fields during specific times of the year, but also serve as a means to impound water and maximize shallow-water habitat. Approximately 100 to 150 acres of early water (September and October) are provided for pintails, teal, and shorebird groups. The refuge provides waterfowl with loafing/shelter/feeding areas by holding water within approximately 2,500 acres of impoundments. An additional 2,500 acres is flooded seasonally by rainfall and backwater flooding from Choctaw Bayou. Currently, the refuge maintains 20 miles of levees, 77 water control structures, and 8 irrigation wells, which provide the infrastructure for all water-management activities within impoundments on the refuge.

In 1988, the area's significance to waterfowl was formally recognized by the Service when it was included as a component of the Three Rivers Waterfowl Habitat Conservation Plan, a project initiative of the LMVJV (Table 2). In January 1989, before the Service could acquire the area and establish Grand Cote NWR, The Nature Conservancy (TNC) purchased 5,940 acres from Coco Farms. In April 1989, the Service leased all rights to the property until funds to purchase the land could be appropriated. Management began immediately, and in 1990, an additional 191 acres were purchased and the Wayne Gremillion tract, south of Choctaw Bayou, was added to the refuge.

During its first year, 5,940 acres were managed. Of this, 950 acres were active cropland, 362 acres were abandoned cropland replanted to hardwoods, 540 acres were abandoned cropland planned for reforestation, 350 acres were active cropland planned for reforestation, 3,653 acres were abandoned cropland in moist-soil units, and 85 acres were crawfish ponds. That year saw not only the planning, but the beginning of water control structure installations, levee repairs, water well rehabilitation, impoundment reclamations, and subdivision of large impoundments.

In 1987, two years prior to acquisition, approximately 3,800 acres were planted to soybeans, milo, and rice. Upon establishment of Grand Cote NWR, the amount of farmed land was reduced and administered through a cooperative farming program. As mentioned in previous sections, these agreements allowed for refuge lands improvements and provided food resources for wintering waterfowl. In 1989, the year the refuge was established, 550 acres of farm lands were planted with a full 20 percent of crops left for wildlife. Most croplands were planted with soybeans, rice, and millet, except some small fields were planted in corn or sunflowers on occasion. By 1992, cooperative farming acreage had increased to 942 acres. All crops were harvested that year and farmers provided services and materials to upgrade the rice farm facilities. Currently, Grand Cote NWR manages 6,075 acres with 660 acres of moist-soil, 1,401 acres of cropland, and 2,492 acres of bottomland hardwood forest in varying age classes.

The landscape surrounding the refuge has also changed within central Louisiana. Historically, the MAV was an extensive 25-million-acre forested wetland complex. Like the refuge lands, most of the surrounding areas were also cleared for agriculture, rural home sites, and flood control projects. Such practices left the landscape severely fragmented with scattered small patches of forest ranging in size from small sites with limited functional value to large sites that have maintained many of their original functions. This fragmentation has created the opportunity for invasive species to become established and has reduced biological diversity. Intensive agriculture has also reduced connectivity between patches, as more efficient farming practices have further reduced the number of remnant forest patches.

Other changes at the landscape level include alteration of hydrology and proliferation of aquatic nuisance species. The natural hydrology of a region is directly responsible for the connectedness of forested wetlands (Fredrickson and Heitmeyer 1988). Large-scale, anthropogenic alterations have changed the natural flooding regime, reducing both the extent and duration of the annual seasonal flooding. These changes, which include levees, ditching and drainage, land leveling, flood control, etc., have altered the processes that form wetland communities and their functions (Fredrickson 2005, King et al. 2005). Lack of annual flooding and reduced water depths have created conditions favorable for the establishment and proliferation of several species of invasive aquatic plants. This vegetation threatens aquatic systems by choking waterways and reducing native floral and faunal diversity.

Prominent exotic invasive plant species occurring on the refuge include trifoliate orange, Chinese privet, and Chinese tallow tree. These woody species rapidly colonize forested wetland areas, replace native plants, reduce diversity, and negatively impact native wildlife. Where possible, triclopyr herbicide has been used to control trifoliate orange thickets. Other nuisance species include cocklebur, sesbania, alligator weed, and willow.

Feral hogs (*Sus scrofa*) are another invasive exotic species which creates management problems on the refuge. Like many invasive species, feral hogs reproduce rapidly and can reduce the success of native wildlife populations by predating juveniles, destroying nests, and consuming food resources. On Grand Cote NWR, hogs damage levees, roads, moist-soil habitats, and cropland habitats through intense rooting activity. Trapping is the primary means of controlling these animals on the refuge. Nutria (*Myocastor coypus*) is another invasive species found on the refuge. These aquatic rodents can cause damage to levees and water control structures, but these effects have been minor on Grand Cote NWR.

Table 2. Historical timeline of Grand Cote NWR

Year(s)	Event
Before mid-1700s	Avoyelles Indians inhabit the region.
1780	French settlers established Avoyelles Post locally and settlement of the prairie land continued. The French explored and settled prairie land and began to develop agricultural lands.
1803-mid 1800s	The United States acquired Louisiana. American settlers established farms and cotton became the dominant cash crop in the region.

Year(s)	Event
1815-1875	Steamboats traveled up the Red River, transporting goods and crops, including cotton bales. By the end of this period as many as 52 boats were navigating the river.
1939	Avoyelles Parish established a sportsman's club to protect local game and wildlife.
1960-1970s	Mature bottomland hardwoods were cleared to create agricultural fields. Levees were constructed to facilitate drainage.
1988	The property to be included in Grand Cote NWR, once established, was included in the Three Rivers Waterfowl Habitat Conservation Plan as a project initiative of the LMVJV and NAWMP.
January 1989	The Nature Conservancy purchased 5,940 acres of what would become Grand Cote NWR from Coco Farms.
April 1989	The Service leased the 5,940 acres from The Nature Conservancy and Grand Cote NWR was established under the authority of the Fish and Wildlife Act of 1956, Emergency Wetlands Resources Act of 1986, and the Migratory Bird Conservation Act as amended in 1989.
1990	An additional 191 acres was purchased by Service as part of Grand Cote NWR. This property is known as the Gremillion Tract.
1991	Funds were appropriated through the Land and Water Conservation Fund to purchase 6,000 acres from The Nature Conservancy.

CHANGES ASSOCIATED WITH GLOBAL CLIMATE CHANGE

The effects of global climate change may gradually increase at Grand Cote NWR over the next 100 years. Within the 15-year time frame of this plan, smaller impacts may be seen. According to the report "Global Climate Change Impacts in the United States" (2009), it is expected there will be higher temperatures, less rainfall, particularly in winter and spring, increased storm intensity and frequency, and more drought throughout the Southeast. It is anticipated that temperatures will increase by at least 4.5^{o}F by 2080 and fire severity will increase 10 to 30 percent within the next 50 years. Within the next 15 years, increasing impacts of higher temperatures will likely cause the spread of invasive species and small changes to native plant and animal distributions. Migratory birds will probably breed and winter a little further north. More southern, tropical species, (i.e., black-bellied whistling ducks) will extend their ranges into more northern parts of Louisiana. Invasive species such as Salvinia, water hyacinth, and Chinese tallow will become more established and extend their ranges further north. The source of these impacts are difficult to isolate as caused either in part or in full by global climate change, but are anticipated nevertheless. This plan addresses these short-term anticipated impacts of invasive species and community shifts through habitat management objectives. Impacts including increased drought, fire severity, and storm intensity cannot be influenced by the scope of this plan (Karl, et al. 2009).

Actions to control invasive species, habitat management, enhancement, and reforestation of some refuge lands may help to offset some of these anticipated changes. .

III. Resources Of Concern

Priorities associated with wildlife and habitat management for the Refuge System are determined through directives, policies, and legal mandates. Resources of concern are defined by the Policy on Habitat Management Plans (620 FW 1) as "all plant and/or animal species; species groups; or communities specifically identified in refuge purpose(s); Refuge System mission; or international, national, regional, state, or ecosystem conservation plans or acts." The Refuge System has further outlined a process for refuges to identify and prioritize resources of concern for management purposes which uses a focal species approach. Additional refuge-specific assessments are used to prioritize resources, including aspects such as relevance to local biological diversity and environmental health, role as an indicator, potential of the refuge habitats to support, responsiveness to management action, and partner priorities. Although the resources of concern terminology can imply to some that those resources not specifically identified within this HMP are not of concern, this is not the case. Instead the identified priority resources of concern should be recognized as the refuge priority resources to be used to define habitat management objectives and priorities, and are often considered focal species, suites or communities which may represent the habitat needs of many additional species.

Resources of concern for Grand Cote NWR were selected after taking into account the conservation needs identified within international, national, regional, or ecosystem goals/plans; state fish and wildlife conservation plans; recovery plans for threatened and endangered species; and previously approved refuge resource management plans as identified in the Comprehensive Conservation Planning Process policy (602 FW 3.4C(1)(e)), input from partners and Service staff through the Biological Review as well as Chapter I of this HMP. The species/communities selected as resources of concern from these plans support the following Refuge System mandates:

- Support refuge purposes and the Refuge System mission;
- Conserve biological integrity, diversity, and environmental health (giving special consideration to rare, declining, or unique natural communities, species, and ecological processes within the refuge boundary and the WGCP); and
- Fulfill Service trust resource responsibilities.

Resources of concern identified for Grand Cote NWR include:

- Wintering waterfowl (supporting refuge purposes and Refuge System mission, and Service trust resource responsibilities).
- Nesting/resident wood ducks (supporting refuge purposes and Refuge System mission, and Service trust resource responsibilities).
- Shorebirds (supporting refuge purposes and Refuge System mission, and Service trust resource responsibilities).
- Bottomland hardwood forest (supporting Conservation of Biological Integrity, Diversity and Environmental Health).

WINTERING WATERFOWL

SIGNIFICANCE

Grand Cote NWR is located in the Mississippi Flyway, which is a critically important ecoregion for migrating and wintering dabbling ducks, wood ducks, and geese in North America (Reinecke et al. 1989), as well as southern breeding populations of wood ducks. Until step-down objectives for the WGCP become established, Grand Cote NWR has been given the MAV step-down objective of 585 acres of moist soil by the LMVJV (USFWS 2004). Infrastructure to provide intensive and highly productive management of moist soil, cooperative farming and Grand Cote NWR's geographical location in the Mississippi Flyway combine to attract thousands of mallards *(Anas platyrhynchos),* pintail (*Anas acuta*), teal (*Anas* spp.), gadwall *(Anas strepera),* and wood ducks (*Aix sponsa*) during the winter.

HABITAT REQUIREMENTS AND REFUGE CONTRIBUTION

North American waterfowl have seasonally dynamic life-cycle needs that are fulfilled by use of a diversity of habitats and foods throughout their annual range, which, for most species, is continental in scale in contrast to resident wildlife. Indeed, habitat (both its quantity and quality) is the primary template for ecological strategies of waterfowl (and all wildlife) and a critical determinant of their survival and productivity. Hence, sustaining viable and harvestable populations of waterfowl depends on conservation and management of habitats throughout the flyways of North America (Reinecke et al. 1989). Concerning wintering habitat, dabbling ducks need a diversity of wetlands including the following: (1) Flooded crop land, (2) natural wetlands, and (3) refuge (i.e., sanctuary) (Reinecke et al. 1989).

Two natural wetland habitats that ducks have used historically in the LMV are bottomland hardwood forests and moist-soil habitats (i.e., early successional grass-sedge and other herbaceous vegetated wetlands). Moist-soil habitats provide critically important foraging and resting areas for waterfowl. Bottomland hardwood and moist-soil habitats are both rich in high-energy natural seeds (e.g., acorns in oak bottomlands; grass-sedge seeds, roots, and tubers in moist-soil areas) and aquatic invertebrates (Kaminski et al. 2003, Heitmeyer 1988, Wehrle 1995). Wintering waterfowl satisfied their nutritional and other physiological needs in these wetlands before large-scale conversion of the MAV to agriculture.

The high-seed production of moist-soil plants and their value as waterfowl foods have been known since at least the 1940s (Low and Bellrose 1944). However, managing seasonally flooded herbaceous wetland impoundments or "moist-soil units" only became a widely accepted practice after many years of research in southeastern Missouri (Fredrickson and Taylor 1982, Fredrickson 1996). Today, more than 20,000 acres of moist-soil habitat are managed in more than 300 impoundments on state and federal lands in the LMV (LMVJV Water Management Tracking System).

Although geese sometimes use moist-soil impoundments and eat shoots of germinating plants, rhizomes, roots, or tubers, the primary emphasis of moist-soil management is to produce seeds that will provide food for ducks. Most research has focused on estimating seed production and studies have shown that, under intensive management, species of barnyard grass (*Echinochloa spp.*), sprangletop (*Leptochloa spp.*), flatsedge (*Cyperus spp.*), smartweed (*Polygonum* spp.), and panicum (*Panicum spp.*) can produce more than a 1,000 pounds/acre of seed (Fredrickson and Taylor 1982). However, we know far less about

production that may be occurring under current conditions in the LMV. Reinecke et al. (1989) suggested an average of 450 kg/ha (400 pounds/acre) of seed might be reasonable because of site and staff limitations. More recently, the LMVJV Waterfowl Working Group used available moist-soil seed estimates of nearly 500 pounds per acre reported by Kross (2006) to increase the value of this habitat to 1,883 Duck Energy Days (DEDs) per acre. Regardless of the quantity of seeds produced, moist-soil impoundments are highly recommended as a means of diversifying habitat (Fredrickson and Taylor 1982, Reinecke et al. 1989) and supplying food with nutrients not generally available in agricultural grains.

Several species of waterfowl heavily utilize flooded habitat in winter for resting and foraging for acorns, other fruits, various seeds, and invertebrates. Mallards, gadwalls, and wigeon all utilize flooded forested habitat as one of the complex of preferred habitats (Fredrickson and Heitmeyer 1988). Wood ducks seek these habitats almost exclusive of other habitats. These areas (e.g., Units 32 and 33) are vital to waterfowl for pair bonding, loafing, sanctuary, thermal cover, and feeding (Reinecke et al. 1989). Ducks like openings in forests, which provide them easy access. Small groups of trees that dominate canopy coverage can be removed to provide the openings that ducks prefer for landing (USFWS 2004).

The remaining essential component of the waterfowl wintering habitat complex is sanctuary. The refuge provides approximately 2,500 acres of sanctuary within the "closed" area which includes willowy swamps, flooded agriculture land and moist soil. Winter is an important season in the annual cycle of waterfowl. It is a biological preparatory period during which many ducks and geese pair and perform other life functions. Females of some species (e.g., mallard) undergo a prebasic molt to acquire their breeding-season plumage in readiness for reproduction. Disturbance-free habitat enables some species of waterfowl to prepare biologically for spring migration and reproduction (Reinecke et al. 1989, Strickland and Tullos 2009). Disturbance can interrupt resting and feeding bouts resulting in a loss of energy and lowering of body weight (Henry 1980; Heitmeyer and Raveling 1988; Kahl 1991). Paulus (1984) found in Louisiana that increased foraging time by gadwalls was insufficient to counter-balance disturbance factors.

NESTING/RESIDENT WOOD DUCKS

SIGNIFICANCE

Wood ducks are year-round residents in the forest lands of the eastern United States, including Grand Cote NWR. Although wood duck numbers declined to drastically low numbers in the early 20th Century due to market hunting, liberal hunting seasons, and habitat loss, today wood duck populations appear stable (Dugger and Fredrickson 2001). However, our understanding of the population status of this species is uncertain. Population estimates are inaccurate due to aerial surveys being ineffective in forested habitats (Dugger and Fredrickson 2001). Wood ducks rank high among species harvested in the Mississippi Flyway and are popular with hunters, especially when other waterfowl species are not present in large numbers (Dugger and Fredrickson 2001).

Because the refuge has a considerable amount of forested wetland habitats, there is substantial opportunity to provide quality habitats for breeding wood ducks. The Wildlife and Habitat Review (USFWS 2004) for Grand Cote NWR suggests wood ducks are an important resource for the refuge.

Grand Cote NWR can play an important role in providing shallow-water habitat for shorebirds. The cooperative farming program contains 360 acres of shallow-water shorebird habitat that can provide up to 50 acres at any given time annually, and 660 acres in moist-soil management provides habitat as well. Where opportunities exist, managing shorebird habitat should be focused during both northbound and southbound movement periods. For areas designated for managing shorebird habitat, consideration for flooding and gradual drawdown should be undertaken between late-February to early-May and again from late-August to early-September. Refuge personnel need to conduct shorebird surveys in order to assess shorebird populations.

HABITAT REQUIREMENTS AND REFUGE CONTRIBUTION

Preferred habitats of wood ducks include forested wetlands, wooded and shrub swamps, tree-lined rivers, streams, sloughs and beaver ponds. Wood ducks seek food in the form of acorns, other soft and hard mast, plant seeds and invertebrates found in shallow flooded timber, shrub swamps and along stream banks. They loaf and roost in more secluded areas, such as dense shrub swamps (Dugger and Fredrickson 2001).

Wood ducks are cavity nesters, seeking cavities in trees within a mile of water. Brood survival is higher in situations where nests are close to water. Due to the loss of forested wetlands and competition for nest sites from a host of other species, natural cavities are the primary limiting factor to reproduction. Nest boxes are commonly used to supplement natural cavities and increase local production of wood ducks. Box programs are not an end to all nesting problems. They require time to clean and repair at least annually. Production can be increased by more frequent checks and cleaning of boxes, but this must be weighed with other time constraints.

Adequate brood habitat can seriously affect duckling survival and reproductive success. McGilvrey (1968) described preferred brood habitat as 30 to 50 percent shrubs, 40 to 70 percent herbaceous emergent vegetation, and 25 percent open water. Overhead cover within one to two feet of the water surface is vital for wood duck broods. Optimum habitat should have 75 percent cover and 25 percent open water, with a minimum of 1/3 cover to 2/3 open water. Placement of boxes in or adjacent to good brood cover will significantly improve duckling survival to flight age.

Wood ducks depend heavily on acorns during winter. Research has documented that acorns compose 75 percent of their diet during the winter (Dugger and Fredrickson 2001). During the spring, an increase in animal foods can be seen in both sexes. Aquatic insects become an important part of the female's diet during egg-laying (Dugger and Fredrickson 2001).

One other factor affecting duckling survival is aquatic invertebrate production, which is probably poor in highly turbid systems such as Choctaw Bayou and Coulee des Grues on Grand Cote NWR. Other than serving as access to good brood habitat (beaver ponds), these water-bodies appear to be relatively poor brood habitat and should not be considered as being important.

The Mississippi Flyway Council has established preseason wood duck banding quotas by the state throughout the Mississippi Flyway to estimate survival. The refuge consistently meets their quota of 150 wood ducks, including age and sex quotas, every year.

SHOREBIRDS

SIGNIFICANCE

Grand Cote NWR provides habitat for many species of migrating shorebirds as well as the year-round resident killdeer, wintering greater yellowlegs, least sandpiper, American woodcock, and Wilson's snipe. Black-necked stilts may breed on the refuge. Conservation of this suite of birds is integral to the purpose of the refuge and is a focus of refuge management. Specific actions, described in this plan, are taken to provide habitat for shorebirds, including retention of water on moist-soil units during shorebird migration and maintenance of open fields in proximity to bottomland hardwood tracts.

HABITAT REQUIREMENTS AND REFUGE CONTRIBUTION

Present Comprehensive Conservation Plan (CCP) objectives for Grand Cote NWR call for 50 acres of shallow, moist mud flats for shorebird habitat during southbound migration (July-October). These mudflats need to be 3 to 4 inches in depth and have exposed mudflats within the units. This may actually involve up to 200 to 300 acres over a season with flooding and drawdowns over any one season allowing for approximately 50 acres of suitable habitat to be available throughout the migration period. The CCP suggests providing habitat for northbound migrants as well, but as with fall habitat provision, habitat should be made available in concert with moist-soil management where there is a waterfowl focus.

For southbound migration, specific measures need to be employed for shorebirds. One approach would be to hold water in some impoundments into July and then gradually draw down. Flooding other impoundments will be necessary for drawing down water in August and September. September habitat would overlap needs of southbound migrating blue-winged teal and northern pintail.

Opportunities exist for managing shorebirds in rice fields and elsewhere in moist-soil units. Providing suitable conditions would include disking vegetation and a subsequent schedule of flooding and prolonged draw downs. Alternative management would involve flooding a field from winter through the summer months to provide preferred water depths during the late-July to early-October time period. Exposed mudflats grading into 3 to 4 inches of water depth capture the needs of all species.

BOTTOMLAND HARDWOOD FOREST

SIGNIFICANCE

Nearly 80 percent of the original bottomland hardwood forest in the LMAV have been cleared and converted to other land uses such as agriculture, leaving widely scattered remnant forested tracts. Within Louisiana, an estimated 70 percent of bottomland hardwood forest has been lost to land conversion. In addition to loss of total forested acres, the high degree of fragmentation within the remaining forest causes complex management problems including loss of corridors, loss of ecosystem functions, and susceptibility to future deforestation. On Grand Cote NWR, there are currently 35 acres of mature forest, 1,576 acres of naturally seeded forest, and 1,613 acres of reforestation. This habitat community is very important for species such as American woodcock, amphibians/reptiles, neotropical migratory birds, wading birds, and resident wildlife.

By providing hard mast, forest openings, understory, multi-layer canopy, and cavities within forested habitats, all the species that were listed above will benefit greatly.

HABITAT REQUIREMENTS AND REFUGE CONTRIBUTION

Upon refuge establishment, much of the land had been cleared of native bottomland hardwood forests. Although some of these lands have remained cleared, a significant amount has been reforested through natural regenerating, direct-seeding, or planting of bare-root seedlings. A detailed account of this is available in Chapter II.

Bottomland hardwood forests are unique for their high frequency of flooding and the ability to survive prolonged periods of inundation. Although the natural flooding regime on Grand Cote NWR has been severely altered, a set of levees and water control structures currently allow 1,186 acres of the refuge's bottomland hardwoods to be flooded within GTRs 32 and 33.

Other reforested areas on the refuge have no water management capabilities. However, these areas provide valuable food and cover resources for a variety of wildlife.

Bottomland hardwood forests are an important habitat component for wintering waterfowl, woodcock, amphibians/reptiles, wading birds, neotropical migratory birds, and resident wildlife. The management treatments performed on bottomland hardwood forests will benefit all the above species.

The goal of reforested areas should be for optimal conditions of bottomland hardwood forests. They should provide a vertical and horizontal structural diversity in terms of tree species, size and age classes, and growth forms (e.g., trees, shrubs, and vines) within a heterogeneous forest canopy comprised of gaps and a complex layering (LMVJV Forest Resource Working Group 2007). A diversity of tree species composition in these bottomland hardwood forests is important, because they can provide heterogeneous vertical structure, a variety of hard and soft mast, and greater insect abundance. A diverse forest also supports trees that mature at different rates, thus allowing for more continuous input of snags, canopy gaps, and coarse woody debris (Harmon et al. 1986, King and Antrobus 2005).

The American woodcock, unlike most of its shorebird relatives, is a bird of forested habitats. Forest loss has likely contributed to the species' declining population trends (Krementz and Jackson 1999), resulting in it being listed as species of high concern (LMVJV Forest Resource Working Group 2007). Woodcock favors young, early succession hardwoods stands (Roberts 1993). These habitats are typically characterized by high densities of saplings, shrubs, canes, and vines that facilitate predator avoidance (LMVJV Forest Resource Working Group 2007). Bottomland hardwoods also play an important role in providing habitat needed to complete their life cycle. Course woody debris in bottomland hardwood forests is an important habitat component and should be a goal during forest management.

IV. Habitat Goals and Objectives

As identified for habitats that require active management, goals and objectives were developed in the CCP, which are expanded upon or combined in this HMP to fulfill the refuge's purposes. A habitat management goal is a broad, qualitative statement that is derived from the established purposes and vision for the refuge. Goals and objectives pertain to resources of concern identified in Chapter III.

Grand Cote NWR was established under the authorities listed in Chapter I, to provide wintering habitat for mallards, pintails, blue-winged teal, and wood ducks. DEDs are calculated for all waterfowl habitats occurring on Grand Cote NWR. DEDs provide an estimate of the number of waterfowl that these habitats can support based on available food resources (Kross 2006). The refuge goal is to provide approximately 12,000,000 DEDs per year within the wetland impoundments occurring on the refuge. This will provide enough food resources to support 100,000 waterfowl per day for a 120-day period during the winter.

GOAL 1. BOTTOMLAND HARDWOOD HABITAT GOAL

Protect, restore, and manage healthy bottomland hardwood habitat to support viable populations of native flora and fauna consistent with sound biological principles and other objectives of this HMP.

OBJECTIVE 1.1.

In Management Units 31, 32, 33, and 25*, provide a functioning GTR by implementing a variable flooding regime which mimics natural regimes by flooding units from late-November through at least the end of January to favor a diversity of species. In order to mimic natural hydrologic cycles, provide that no flooding occur approximately once every 3 to 5 years.

*Management Unit 25 consists primarily of willows and is managed for wood duck brood habitat.

Resources of Concern: Wintering waterfowl, nesting and resident ducks, and bottomland hardwood forests (e.g., woodcock, amphibians/reptiles, wading birds, neotropical migratory birds, and resident wildlife)

Rationale: Due to the young age of these forested units, regeneration is a not a concern within the next 15 years. The focus is primarily on survival. However, long-term strategies should include a combination of silviculture methods utilized to meet uneven-aged forest management objectives including thinning and small patch/clear cuts that will eventually mimic old growth forest conditions.

CCP Objective(s): A1, A2, A3, A5, A8, A9, A11, and B1

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Water level by date. Forest mid- and under-story structure. Bottomland hardwood forest health and productivity for wildlife.	Forest inventory sampling (traditional parameters, e.g., species composition, mid-story cover).
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl Counts (bi-weekly Sep 15-Mar 1)

(Note: This table does not represent a commitment to conduct this monitoring, but rather recognizes that specific reasonable and appropriate methods are possible and appropriate, dependent of the outcome of the separate and subsequent inventorying and monitoring planning process).

OBJECTIVE 1. 2.

In Management Units 7, 8, 28, and 29, monitor reforested stands of native deciduous bottomland species for survival. These seedlings were planted in 2010 and again in 2012 on 12-foot by 12-foot spacing at a density of 302 seedlings per acre.

Resources of Concern:

Nesting and resident wood ducks and bottomland hardwood forest (e.g., woodcock, amphibians/reptiles, wading birds, neotropical migratory birds, and resident wildlife).

*Rationale**:***

CCP Objective B-2 calls for an additional 125 acres of reforestation of open areas into appropriate bottomland hardwood tree species. In 2010, 427 acres were converted from agriculture and planted in Management Units 7, 8, 28, and 29. However, this effort failed due to extreme drought. The same areas were planted again in the late winter/early spring of 2012.

CCP Objective(s): A1, A2, A3, A5, A8, A9, A11, B1, and B2

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Regeneration/survival of seedlings within reforested areas. Forest health and productivity for wildlife.	Forest inventory sampling (traditional parameters, e.g., species composition). Inventory survival plots.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Land bird species composition and abundance, native wildlife (e.g., deer, small mammals).	Point counts.

OBJECTIVE 1. 3.

In Units 32 and 33, provide 1,024 acres of young bottomland hardwood habitat.

Resources of Concern: Bottomland hardwood forest (e.g., woodcock, amphibians/reptiles, wading birds, neotropical migratory birds, and resident wildlife).

CCP Objective(s): A1, A2, A3, A5, A8, A9, A11, and B1

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Forest overstory structure and composition. Forest mid- and under-story structure and composition. Bottomland hardwood forest health and productivity for wildlife.	Forest inventory sampling (traditional parameters, e.g., species composition, mid-story cover). Annual hard mast survey.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Forest breeding bird species composition, abundance, and waterfowl use.	Breeding landbird survey (point counts/waterfowl survey).

OBJECTIVE 1. 4.

In Management Units 32, 33, 12, 24, 25, and 34, promote the growth of native understory vegetation by providing forested habitat containing < 5 percent exotic invasive vegetation (e.g., Chinese tallow, Chinese privet, and trifoliate orange).

Resources of Concern:

Bottomland hardwood forest (e.g., woodcock, amphibians/reptiles, wading birds, neotropical migratory birds, and resident wildlife).

CCP Objective(s): A1, A2, A3, A5, A8, A9, A10, A11, and B1

Rationale: Promoting native understory vegetation will support a wide variety of wildlife and contribute to the biological integrity, diversity, and ecological health of bottomland forests on the refuge.

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Bottomland hardwood forest health and productivity for wildlife.	Forest inventory sampling (traditional parameters, e.g., species composition, mid-story cover).
Primary Wildlife Response Variables	**Probable Assessment Methods**
Forest breeding bird species composition, abundance and waterfowl use.	bird surveys

OBJECTIVE 1. 5.

In Management Units 15,16,17,24,25,31,32, and 33, maintain 100 nest boxes for wood ducks.
Resources of Concern: Nesting wood ducks

CCP Objective: A2

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Provides artificial nesting sites in lieu of natural cavities.	Pre- and post-nesting season inspection of nest boxes.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Utilization of nest boxes by wood ducks.	Maintain database of usage, predation, and success/ survival.

GOAL 2. FORESTED UPLAND HABITAT GOAL

Protect and manage upland forested areas to promote the biological integrity, diversity, and ecological health of the refuge and the surrounding landscape.

OBJECTIVE 2.1

In Management Units 35 and 36, over the planning period covered by this HMP, provide 273 acres of native mixed pine-hardwood forest with <5 percent cover of exotic plant species to serve as an upland refugium for terrestrial wildlife during flood events and enhance visitor services at the refuge by providing hunting opportunities.

Resources of Concern: None identified

CCP Objective: B2

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Forest over-story structure and composition. Forest mid- and under-story structure.	Forest inventory sampling (traditional parameters, e.g., species composition, mid-story cover). Annual hard mast survey
Primary Wildlife Response Variables	**Probable Assessment Methods**
Forest breeding bird species. Wildlife use during floods.	Breeding landbird survey (point counts). Observation by refuge personnel.

GOAL 3. WATERFOWL IMPOUNDMENTS-CROPLAND HABITAT GOAL

Manage water level and crop production of high-carbohydrate (hot) cereal grains on 1,500 acres of cropland habitat to provide food resources for migrating and wintering waterfowl to achieve the North American Waterfowl Management Plan (NAWMP) step-down objectives for Louisiana.

OBJECTIVE 3.1

In Management Units 13, 14, and 23 (412 combined acres), provide 775,796 DEDs (moist-soil) and up to 11,845,020 DEDs (unharvested corn) through planting of crops and then flooding from late-November to late-February. Also provide shallow mudflats no more than 3 to 4 inches in depth for shorebird use.

Resources of Concern: Wintering waterfowl and shorebirds

CCP Objective(s): A1, A6, and B4

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Seed planting dates. Herbicide application. Crop health and productivity for wildlife.	Staff gauges – water depth. Flood by date. Harvest records. Calculate seed availability/amounts in fields.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl survey (September 15-March 1). Shorebird survey.

OBJECTIVE 3.2

Provide 49,623 (harvested rice) to 10,288,740 (unharvested corn) DEDs in Management Units 1, 3, 4, 5a, 5b, 5c, 5d, 11, 26, and 27 (363 acres combined), through farming of crops to be flooded from late-November to late-February. Provide shallow water conditions (3 to 4 inches) during rice planting to benefit shorebirds.

Resources of Concern: Wintering waterfowl and shorebirds

CCP Objective(s): A1, A6, and B4

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Seed planting dates. Herbicide application. Crop health and productivity for wildlife.	Create openings for waterfowl (disking). Flood by date. Calculate seed availability/amounts in fields.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl survey (September 15-March 1). Shorebird survey.

OBJECTIVE 3.3

In Management Units 2, 9, 10, 19, 20, 21, and 22 (636 acres combined), provide 5,457,600 to 8,646,000 DEDs through farming of 300 acres of crops to be flooded from late-November to late-February using refuge staff and resources; remainder of units will be either moist-soil or cooperative farmed resulting in DEDs of 46,704 to 1,197,588. These fields are not level enough for rice production.

Resources of Concern: Wintering waterfowl and shorebirds.

CCP Objective(s): A1, A6, and B4

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Seed planting dates. 300-acre area in force account farming. Crop health and productivity for wildlife.	Flood by date. Herbicide application. Calculate seed availability/amounts in fields.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl survey (September 15-March 1). Shorebird survey.

OBJECTIVE 3.4

Maintain 2,500 acres of refuge as waterfowl sanctuary and use adaptive management for yearly regulations, delineations, and modifications.

Resources of Concern: Wintering waterfowl, nesting/resident wood ducks.

CCP Objective(s): A1 and A2

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Acres-area in sanctuary. Level (frequency/degree) of disturbance events.	Law enforcement. Flood by date. GIS mapping.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use	Waterfowl survey (bi-weekly September 15-March 1).

GOAL 4. WATERFOWL IMPOUNDMENTS—MOIST-SOIL HABITAT GOAL

Manage moist-soil habitat to promote natural herbaceous wetland vegetation beneficial for wintering waterfowl to achieve the NAWMP step-down objectives for Louisiana and for various marsh birds with complementary habitat requirements.

OBJECTIVE 4.1

Provide 1,129,800 DEDs utilizing a total of 600 of 988 acres within Management Units 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, and 30. Manage water drawdown rates and disk and/or apply herbicides as need to control nuisance vegetation and promote desirable wetland vegetation.

Resources of Concern: Wintering waterfowl and shorebirds.

CCP Objective(s): A1, A6, and B3

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Percent herbaceous cover; (desirable/non-desirable).	Herbaceous cover plots (times samples per year). Disturbance- plowing/herbicide Calculate seed availability/amounts in fields
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl survey (bi-weekly September 15-March 1).

OBJECTIVE 4.2

In Management Units 15, 16, 17, 18, 21, 22, 24, and 30 (total of 988 acres) manage water levels during the winter and early-spring to maximize availability of food and cover resources (e.g., moist soil, milo, corn, and rice), including both vegetation and invertebrates.

Resources of Concern: Wintering waterfowl and shorebirds.

CCP Objective(s): A1, A6, and B3

Adaptive Management Monitoring Elements

Primary Habitat Response Variables	Probable Assessment Methods
Water levels by date. Acres-area in moist soil. Productivity for wildlife.	Flood by date. Herbicide application. Calculate seed availability/amounts in fields.
Primary Wildlife Response Variables	**Probable Assessment Methods**
Wintering waterfowl use.	Waterfowl survey (September 15-March 1) Shorebird survey.

V. Habitat Management Strategies

The following strategies will be used as appropriate to conduct habitat management to meet objectives under this HMP.

- Moist-soil management (water control, mechanical control, chemical control, crop farming).
- Crop management (cooperative farming, force account farming).
- Exotic and invasive plant management – GTR management (water management).
- Waterfowl sanctuary management.
- Population management (beaver management, feral hog management, wood duck box management)

Prescriptions for management will be determined annually based on current unit specific habitat conditions and will be within the sideboards created by the following overall prescriptions for management within the scope of this HMP. Annual management prescriptions and outcomes will be incorporated in the Annual Habitat Work Plan as established in the Habitat Management Planning Policy (620 FW1).

POTENTIAL MANAGEMENT STRATEGIES

POTENTIAL BOTTOMLAND HARDWOOD MANAGEMENT STRATEGIES

Unimpounded Bottomland Hardwood Forest Management

Most of the bottomland hardwood forest on Grand Cote NWR is in young timber, either naturally regenerated or artificially regenerated. Silvicultural manipulation is not expected to be necessary during the life span of this HMP. It is expected that bottomland hardwood forests on Grand Cote NWR will be managed according to guidelines set forth in (LMVJV Forest Resource Conservation Working Group, 2007). However, active management of these forest units will be initiated after 2021.

Greentree Reservoir (GTR) Management

Water management is the signature, and most critical, aspect of GTR management. Water management is used to provide habitat for wintering waterfowl. The impact of water management on the habitat is a temporary enhancement, with minimal negative impacts provided that flooding occurs during the dormant periods of the forest trees' annual cycle. Recommendations for water management include flooding regimes that mimic natural cycles, including years of no flooding and water depths of <18 inches. Flooding of the GTRs should begin no earlier than late-November, after the trees have gone dormant. Standing water should be removed from the units before trees leaf out in the early spring. By doing this, trees will be flooded while dormant and suffer no mortality. Water control structures allow for pulses of water from rainfall events to flow through the system and further mimic natural cycles and inhibit prolonged stagnant water levels. This flooding regime provides food and cover during the winter months for wintering waterfowl, especially wood ducks and mallards.

Forest management is used to provide habitat for a diversity of wildlife species including wintering habitat for migratory waterfowl and nongame migratory birds. There is currently no capability to conduct forest management, and little need as most GTR stands are young (<15 years) and do not require management at this time. As land is replanted to native hardwoods, survival plots will be monitored as needed. By recording the proportion of live seedlings that survive from year-to-year, an approximated survival rate for the entire unit may be calculated. To ensure the continued success of the reforestation efforts at Grand Cote NWR, water control structures and levees must be maintained around the perimeter of the GTRs, and growing season flooding impacts to planted trees should be minimized, especially in the first years following planting. Negative impacts can also be minimized by controlling feral hog populations and invasive vegetation.

Wood duck nest box management is a method used to compensate for a limited supply of natural nest cavities to support wood duck reproduction. Guidelines (Bowers 2003) provide direction for the use of wood duck nest box programs on refuges. Boxes should be placed in or adjacent to good brood habitat in areas where they are not subject to flooding. It is critical that boxes have functional predator guards and are checked and repaired annually; otherwise, boxes are considered death traps for the hen and her clutch. Conical predator guards should be maintained on all of the boxes to more effectively keep rat snakes from climbing into the boxes. Some reports indicate that if rat snakes learn there is a meal of eggs in the nest box, it becomes very difficult to exclude them from the boxes. If boxes cannot be properly maintained, they should be boarded up until sufficient effort can be put toward operating an effective nest box program. Cleaning the boxes after the initial peak of nesting (about mid-April) will significantly improve annual production if competition for nest sites increase.

As previously stated in the refuge vision (Chapter I), “Grand Cote National Wildlife Refuge will provide optimal production habitat for wood ducks.” At the turn of the century, wood duck populations had drastically dropped to a level that many feared their extinction (Bellrose 1976). The wood duck population rebounded through the implementation of harvest regulations; however, researchers realized the lack of nesting habitat would limit the population growth (Hawkins and Bellrose 1940, Mclaughlin and Grice 1952). To help compensate for the lack of natural nesting cavities, nest boxes have been shown to be an effective method to provide nesting habitat for wood ducks (Hawkins and Bellrose 1940). Nest boxes have become a regular part of wood duck management in many locations throughout North America. Grand Cote NWR currently has more than 100 nest boxes located throughout the refuge; boxes are located adjacent to suitable brood habitat and a monitoring program is in place.

POTENTIAL FORESTED UPLAND MANAGEMENT STRATEGIES

In principle, upland forest habitat can be managed under a range of intensities from passive (protection only) to fairly intensive management, including fire, silvicultural manipulation, and control of exotic plants and animals. The intensity selected for a given habitat unit depends on the objectives for that unit. Specific strategy options which could be applied to the forested uplands on Grand Cote NWR include:

- Prescribed fire, applied on a 3- to 5-year rotation, for the purpose of maintaining a pine component and favoring upland oaks over bottomland species such as water oak and sweetgum in the mixed pine portions of this unit;

- Silvicultural manipulation including thinning, regeneration cuts, and improvement cuts, for the purpose of controlling stand growth, density, and species composition;
- Herbicidal control of invasive exotic plants such as Chinese tallow and privet, for the purpose of restoring/maintaining a largely native vegetation type in place.

POTENTIAL WATERFOWL IMPOUNDMENTS—CROPLAND MANAGEMENT STRATEGIES

Un-harvested grain crops are a critical ingredient of waterfowl foraging habitat needs, and if not available, the attractiveness of a refuge for waterfowl is decreased. This also goes hand-in-hand with refuges providing adequate sanctuary from disturbance along with the grain crops. Rice, corn, and milo are top choices as grain crops for ducks. Rice is particularly resistant to decomposition even under flooded conditions and is high in calories. Corn and milo also provide high-energy resources for waterfowl and can generally be kept above the water surface, but problems often arise from depredation prior to flooding, as well as seed degradation after flooding. It is important to manage the cropland program to provide a good diversity of waterfowl foods.

Rice, milo, and corn have proven to be the best grain crops with the highest nutritional values for ducks in the MAV (Strader and Stinson 2005). Soybeans can be grown by the refuge cooperative farmer(s) for their share; however, the refuge does not take soybeans as the refuge share because of its low nutritional value, as well as its rapid decomposition after flooding. Soybeans will not be planted by refuge staff or taken as the refuge share from the cooperative farmer(s).

There was much discussion during the Biological Review regarding the laser leveling of agricultural fields to maximize wintering waterfowl use by providing a rice base on this refuge. Although important aspects of micro-topography may be lost, this approach can still provide good shorebird habitat. However, those with the greatest expertise in shorebird management felt that fields with ridges and swales are preferred for providing shorebird foraging habitat for the greatest diversity of species. Research could be initiated to document the effects of laser leveling on overall productivity and wildlife use of impoundments.

National wildlife refuges have two potential methods in which to accomplish the management required in producing crops for waterfowl. A common method is cooperative farming, in which typically a local farmer agrees to farm the refuge crop units, with a certain percentage of the total crops planted by that farmer to be left un-harvested in the refuge farm fields as the refuge's share. A cooperative farming agreement is clearly written that covers the specific details of the farming activities for each farmer in any given year and is signed/dated by both parties. The standard crop share split for farming on refuges nation-wide is 75 percent farmer's share and 25 percent refuge share. However, the share split at Grand Cote NWR is presently 80 percent refuge farmer and 20 percent refuge share. Due to local rental rates, soil types, and flooding potential, the refuge determined that a reduced crop share split could be justified. The other alternative, commonly called forced-account farming, is for refuge staff to farm the crops using refuge staff time, equipment, and budget to support the costs of management. In general, cooperative farming is more efficient on an acre-by-acre basis, in that professional farming methods generally produce higher seed loads per acre, while forced-account farming generally is less professionally applied and often produces significantly less seeds/acre. Based upon refuge-grown rice at Morgan Brake NWR in 2007, production under forced-account farming is expected to be about 50 percent of commercial yields. Conversely, however, cooperative

farming requires a proportion of acres (usually 75:25), which is used to produce crops that do not contribute resources to wildlife, while forced-account farming allows all farmed acres to be used to provide wildlife resources and is therefore more efficient in use of refuge land. Both methods are viable on refuges, and may be the chosen method depending on a variety of factors, including the acres available for crop management, availability of a skilled farmer, refuge staffing levels, budget, and equipment resources.

Cooperative farming is a critically important component of the refuge meeting its waterfowl foraging habitat objective. At this time, cooperative farming is the only option available for producing all the necessary agricultural crops on Grand Cote NWR. The refuge initiated small-scale forced-account farming during 2008, but cannot count on this annually due to lack of resources.

Currently, cooperative farmers perform some legitimate in-kind services and leave a percent of the crops un-harvested in the field for wildlife as payment for growing grain crops on refuge lands. Utilizing farmer services achieves one major objective: provides food resources that are necessary to achieve Louisiana step-down objectives for waterfowl. Importantly, the cooperative farming program also helps maximize waterbird management overall on non-forested lands; improves water management capabilities; and allows diversification of habitat across the refuge, such as millet, soybeans, rice, milo, sunflowers, corn, etc. The refuge farming program provides a unique opportunity to achieve a diverse food base, produce a large quantity of highly nutritious food, and make foods available for a diverse group of organisms. The presence of the farming program also provides critical shallow-water habitat for waterfowl and shorebirds.

Cooperative farming has been and will continue to be a cost-effective mechanism to provide the high-quality “hot foods” required by wintering waterfowl. Management of a cooperative farming program reduces dependence on refuge staff, station funds, and equipment.

Force account (refuge conducted) farming is an option on Grand Cote NWR, but current and expected resources allow for only up to 300 acres to be managed in this way. Force account farming must be used if rotational crops are used in moist-soil units at an interval of more than every other year. The express benefit to this method is the 100 percent usage of refuge crop acres for wildlife. Force account crops will be cultivated utilizing standard farming practices such as planting, plowing, and herbicide treatments. However, due to equipment, staffing, and funding limitations, production levels of force account crops may be lower than those of cooperative farmed crops.

POTENTIAL WATERFOWL IMPOUNDMENTS—MOIST-SOIL HABITAT MANAGEMENT STRATEGIES

Moist-soil management is the science, and to some degree the art, of modifying soil conditions to stimulate the production of preferred early successional plants in an open impoundment setting. It is most typically used to produce high-quality food resources for wintering and migrating waterfowl, including plant seeds and parts, as well as invertebrates. Moist-soil management is a science supported management method, which is applied most effectively on a local basis using adaptive management strategies to plan, implement, assess, and modify prescriptions on a continual basis. Annual Habitat Work Plans (620 FW1, Exhibit 2) are used to apply adaptive management to moist-soil management on an annual basis. The Moist-soil Management Guidelines for the Service’s Southeast Region (Strader and Stinson 2005) provide guidance and information on application of moist-soil management for refuge managers

In an overall sense, the management strategy incorporates the setting back of succession and modification of soil and vegetation conditions through actions, including some or all of the following techniques: (1) Management of water levels; (2) mechanical plant control; (3) mechanical soil disturbance; (4) chemical plant control; and (5) prescribed fire. The most important factors that determine plant responses to moist-soil manipulation are: (1) The amount of sunlight; (2) soil temperature; (3) soil moisture; (4) soil chemistry; (5) seed bank; and (6) successional stage of the plant community. By strategic application of prescriptions to affect these factors, moist-soil management can produce an optimally productive community of early successional herbaceous plants for target wildlife species (Strader and Stinson 2005). Modifications to prescriptions to meet various objectives can be used to provide optimal conditions for a range of species groups (e.g., waterfowl, shorebirds, and marsh birds).

In addition to the target species, the conditions provided by moist-soil management provide benefit for a variety of other groups of species, including invertebrates, reptiles and amphibians, small mammals, and non-target migratory birds. The prolific invertebrate community can include aquatic and terrestrial earthworms, leeches, shrimp, mayflies, dragonflies, beetles, butterflies and moths, and snails, providing a variety of food resources for higher order species, such as herpetofauna and birds.

Water manipulation is one of the most essential management techniques for moist-soil management. Strategic application and removal of water is critical in determining soil moisture, enhancing desirable plant species germination, and control of non-desirable vegetation. Drawdowns are the removal of water. Variations in application of timing and duration of water removal can be used to manage for a variety of effects which vary with site conditions. Timing of drawdowns can be used to affect the species of plants that germinate. Common timing variations in the Southeast include “early” or during the first 45 days of the growing season, “late” or during the last 90 days of the growing season, or “mid-season” during the intervening period between “early” and “late.” A slow drawdown is an effective way to conserve soil moisture and partial re-flooding can maintain high soil moisture content. Year-round retention of water (i.e., flooding) can be used to periodically set back succession, but at the cost of a year of moist-soil plant production. Seasonal water control is a critical aspect, as timing and depth are key factors in making plant seed and invertebrate resources available to target migratory wildlife (Fredrickson 2001).

Mechanical control can be applied to periodically set back succession and maintain desirable plant communities. Prescription variations include method of treatment (e.g. disk, mow), annual timing, rotation frequency, and application degree (e.g. depth of disk, height of mow, strip mow). Mechanical control most commonly includes disking of the soil under condition specific variations of depth and timing and is applied on a rotational basis (Fredrickson, 2001). Common rotations in the Southeast are 2 to 4 years, but are largely dependent on site specific objectives and conditions. A variety of soil disturbance tools may be used for application of a similar treatment. Disking may be combined with other manipulations, such as deep-disking to improve soil fertility or smoothing to improve soil-moisture conditions (Strader and Stinson). Mowing of existing vegetation can be used to set back succession and modify vegetation structure as well. This method may be sufficient in some sites based on conditions (Fredrickson 2001)

Chemical control, or use of herbicides, is used to set back succession or exclude undesirable or invasive plants, particularly when conditions are not appropriate to apply mechanical control. A variety of Service-approved herbicides may be used, dependent on the site-specific objectives and conditions. Whenever a chemical is needed, the most narrowly specific chemical available

for the target organism in question should be chosen, unless considerations of persistence or other hazards preclude that choice (7 RM 14). All chemicals will be approved through the pesticide use proposal process and will follow Integrated Pest Management Policy (569 FW 1). Prescribed fire is yet another method used to set back succession. Application of fire removes surface vegetation and encourages increased soil temperatures. Prescribed fire is applied according to site-specific objectives and conditions, with variations in percent of area burned and intensity of treatment possible within, or between, applications. Annual timing, rotation, and intensity can also be prescribed to meet specific habitat objectives. Prescribed fire is applied according to protocols established in the refuge's Fire Management Plan. Application of fire requires significant management resources that are not available at all stations, such as Grand Cote NWR, including specialist staff such as a fire boss and fire-qualified crew, equipment, funding, and an approved fire plan.

Crop farming is commonly included in addition to moist-soil management. This combination allows the refuge to provide a more diverse food source for wintering migratory birds. Crop farming in moist-soil areas is simply another technique to set back succession through mechanical and chemical techniques. Farming sets back natural succession and helps promote the desired moist-soil vegetation the following year. Although the natural vegetation is lost for a year, un-harvested crops provide high carbohydrate "hot" foods, particularly beneficial to the needs of wintering waterfowl and also used by resident species, such as white-tailed deer, bear, raccoon, and small mammals. Crop farming can be applied through cooperative farming or force-account farming programs.

POTENTIAL REFUGE-WIDE MANAGEMENT STRATEGIES

Sanctuary

Sanctuary can be applied to waterfowl habitat in different ways. Sanctuary can mean that no public use is permitted in waterfowl habitat at any time or that no waterfowl hunting can occur, but other public uses are permitted. Some refuges limit waterfowl hunting to only a certain number of days per week to limit disturbance to ducks. The size or percentage of waterfowl habitat that is sanctuary varies also. Sanctuary can be in moist-soil habitat, flooded bottomland hardwood forest, and/or flooded croplands. Strickland and Tullos (2009) recommend that 20 to 25 percent of waterfowl habitat be in sanctuary to reduce disturbance. Sanctuary should be available in all habitat types, including moist soil, agriculture, and bottomland hardwood forest (USFWS 2004).

Grand Cote NWR contains approximately 4,400 acres that can be classified as waterfowl habitat. Waterfowl hunting is allowed on approximately 1,900 acres and 2,500 acres are sanctuary, resulting in an approximate 45/55 spilt of hunted area vs. sanctuary, respectively. The sanctuary contains all waterfowl habitat types found within the refuge. Refuge personnel in the past have seen little disturbance to waterfowl within the sanctuary.

Exotic Invasive Plants

The presence of exotics and invasive plant species can alter the function of ecosystems due to the loss of wildlife habitat, displacement of native species, change in carrying capacity from reducing native forage production, lower plant diversity, and increase soil erosion and soil sedimentation. These negative effects decrease the biological integrity, diversity, and

environmental health of the refuge; and therefore, require a management strategy that will control, and if possible, eradicate the exotic species.

The Chinese tallow tree is on the verge of significantly impacting the biological integrity of the refuge. Tallow trees are a small, fast-growing tree with high reproductive capability. The tree grows in a variety of habitats, is extremely invasive, and can form monoculture stands quickly. Chinese tallow cannot be completely eradicated from the refuge, but extensive measures should be made to control its spread. Other invasive species that the refuge has good opportunity to control with conventional methods are Chinese privet and chinaberry. All of these species have been found in both the uplands and bottomlands on the refuge.

Invasive plant control is a significant issue for many national wildlife refuges, but is labor intensive and costly. Significant resources should be focused on determining the extent of each invasive species on the refuge and developing effective methods to control their spread. Successful control requires careful planning, implementation, and monitoring.

The presence of exotics and invasive plant species can alter the function of ecosystems due to the loss of wildlife habitat, displacement of native species, change in carrying capacity from reducing native forage production, lower plant diversity, and increase soil erosion and soil sedimentation. These negative effects decrease the biological integrity, diversity and environmental health of the refuge; and therefore, require a management strategy that will control, and if possible, eradicate the exotic species.

Chemical pesticides will be used primarily to supplement, rather than as a substitute for, practical damage control measures of other types. Whenever a chemical is needed, the most narrowly specific pesticide available for the target organism in question should be chosen, unless considerations of persistence or other hazards would preclude that choice (7 RM 14). All chemicals will be approved through the pesticide use proposal process and will follow Integrated Pest Management Policy (569 FW 1).

The refuge has been aggressively controlling exotic plants during the past few years. Mechanical removal of exotic trees has not been effective due to stump sprouting. Monitoring efforts have shown some chemicals to be more effective than others. The Global Invasive Species Database (*http://www.issg.org/database/species/ecology.asp?si=999&fr=1&sts=sss&lang=EN*) recommends using Element 4 for treatment of Chinese tallow trees. Element 4 has been 97 percent effective in controlling Chinese tallow trees when proper applications have been used.

Management of the moist-soil habitat in Management Units 15, 16, 17, 18, 21, 24, and 30 may require the use of chemicals periodically to control undesirable vegetation, such as red vine, buttonbush, *Sesbania,* cocklebur*,* etc.

Although the chemicals identified above have proven to be effective, the refuge is always striving for better methods. If, over time, these chemicals are shown through monitoring to lose their efficacy, other methods will be investigated and/or evaluated through an adaptive management process.

Exotic and/or Nuisance Animals

Beavers have the potential to significantly adversely affect bottomland hardwood forests by damming sloughs and brakes (Mahadev et al. 1993). Forests inundated into the growing season quickly show signs of stress, and trees eventually die. Beavers also kill trees by girdling and felling. One study in Mississippi showed beavers on average damaged $164/acre (1985 values) of timber by girdling and felling (Bullock and Arner 1985).

Historically, beaver numbers were controlled by trapping for the demanding fur trade. In the 1980s, annual harvests exceeded 1 million beaver pelts across the nation (Hill 1982). Recently due to cultural and societal changes, furs are not in demand, and therefore little trapping is conducted, causing beaver numbers to be high (Hill 1982).

Feral hogs are very prolific and become wary with hunting pressure; once populations are established, they are difficult to control (Dickson, et al. 2001). Synatzske (1993) explains that feral hogs are opportunistic omnivores with diets that may include oak mast, soft mast, succulent grasses and forbs, fungi, roots, tubers, and animal matter, depending on availability. They are considered potential direct competitors with native species such as deer, turkey, bear, squirrel, skunk, raccoon, opossum, fox, bobcat, and waterfowl. Identified animal components in the diet of hogs have included lizards, frogs, mice, birds, and deer fawns. They are also known predators of ground nests including that of birds, rabbits, and turtles. Feeding behavior by hogs causes indirect impacts due to rooting and digging activities. Rooting and digging behaviors can contribute to erosion and destruction of native plant species, resulting in changes in successional patterns and soil properties (Synatzske 1993). Management of feral hogs is a long-term control program aimed at reducing population size. Control methods include trapping, snares, shooting, recreational hunting by the public, and hunting with dogs.

Methods for control include removing beaver dams manually, with heavy equipment, or by explosives, trapping, and shooting by Service employees. The use of guards and fencing around water control structures to prevent beavers from obstructing water flow will also be implemented as a management tool, when population control measures are not implemented or effective.

Control of feral hogs on Grand Cote NWR is attempted through a combined effort of trapping and shooting by refuge staff and volunteers. An active trapping program is in place and previous trapping and shooting activities have been effective. Presently, feral hogs cause minimal damage on the refuge and continued efforts should maintain or decrease current population levels.

MANAGEMENT STRATEGY PRESCRIPTIONS

GREENTREE RESERVOIR (GTR) MANAGEMENT PRESCRIPTIONS

In 1989, refuge staff direct-seeded oaks with a modified soybean planter in Units 32 and 33. These units had previously been in agriculture and were planted to create a GTR. Due to the young age of these trees, management focuses primarily on survival rather than silviculture (Table 3).

Forest habitat in the GTR will not be silviculturally manipulated during the lifespan of this HMP, which parallels that of the CCP. Artificially regenerated stands in Units 32 and 33 will be 32 years old at the end of the planning period (2021), at which time they will require cruising and evaluation for possible treatment. Any management conducted on these forests is contingent upon availability of sufficient management capability and resources.

To meet Objective 4.1.1 in Management Units 31, 32, and 33 for wintering waterfowl, and Unit 25 as wood duck brood habitat, the following management prescriptions will be used:

- Flood units in late fall after trees have entered dormancy, utilizing low-lift pump on Coulee des Grues, if water levels permit.
- Maintain water levels while allowing for natural pulses from rainfall events, throughout the winter to provide habitat.
- Draw down water in early spring or as conditions allow.
- Leave units dry; do not flood once every 3 to 5 years.
- Conduct forest inventory sampling.
- Delay draw down in Unit 25, which is dominated by black willow to provide wood duck brood habitat in the spring.

Table 3. Bottomland/GTR - Total DEDs per management unit on Grand Cote NWR

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DEDs
7	110	Reforestation	Survival of trees planted in 2010	None	N/A
8	43	Reforestation	Survival of trees planted in 2010	None	N/A
12	251	Forested Wetland	100% Natural regeneration/moist soil	None	28,865
15	65	Forested Wetland	80% Natural regeneration/20% moist soil	None	24,479 (calculated at 20% moist soil)
25	196	Green Tree Reservoir	80% black willow, 20% moist soil	Late fall flood followed by late early spring drawdown. No flooding every 7 years.	73,813 (calculated at 20% moist soil)
28	34	Reforestation	Survival of trees planted in 2010	None	N/A

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DEDs
29	238	Reforestation	Survival of trees planted in 2010	None	N/A
31	240	Natural Regeneration	80% green ash/hackberry, 20% black willow	None	N/A
32-GTR 1	288	Greentree Reservoir	90% Nuttall, water, and willow oak- 10% black willow	Late fall flood followed by late/ early spring drawdown. No flooding every 7 years.	59,616
33-GTR 2	739	Greentree Reservoir	90% Nuttall, water, and willow Oak- 10% black willow	Late fall flood followed by late early spring drawdown. No flooding every 7 years.	152,973
34-Gremillion Tract	177	Natural Regeneration	80% green ash/hackberry, 20% black willow	None	N/A
35	273	Upland Forest	Consists of loblolly pine and Chinese tallow	None	N/A
36	185	Bottomland Hardwood Forest	Consists of 30% loblolly pine and 70% green ash, oak, and hackberry mix	None	N/A

To meet Objective 4.1.1 in Units15, 16, 17, 24, 25, 31, 32, and 33, the following management prescriptions will be used to provide nesting structures for wood ducks.

- Provide approximately 100 wood duck nest boxes;
- Maintain structural integrity and predator guards;
- Clean old nest material out and fill boxes with clean nest material in late winter;
- Monitor usage, predation, success/survival;
- Maintain database of usage, predation, success/survival;

FORESTED UPLAND MANAGEMENT PRESCRIPTION

Existing forest vegetation in the upland forest habitat will be allowed to develop into mature hardwood and/or mixed pine/hardwood forests. Exotic plants and exotic/nuisance animals will be controlled when exotic plants exceed 5 percent cover and feral hogs impact crop production. This approach has been selected for the following reasons:

- The refuge currently does not have appropriate staff to implement active forest management (i.e., a forester);
- The upland forest unit is too small to function as an operable forest unit by itself. Were the bottomland hardwood forest to be actively managed, the upland forest unit could be included in the overall stand entry rotation;

CROPLAND MANAGEMENT STRATEGY PRESCRIPTION

LMVJV DEDs refuge step-down objectives listed in the CCP (USFWS 2006) states an objective of 1,850 acres of managed croplands for wintering waterfowl habitat. Included in this is up to 370 acres of un-harvested acres. The original objective acreage was reduced due to reforestation of approximately 400 acres. Currently, there are approximately 1,400 acres classified as managed croplands on Grand Cote NWR. Force account farming comprises 300 to 400 acres on any given year and the remaining acreage is rotated moist-soil and cultivation. However, these acres are not static and will change from year-to-year due to units being rotated between agriculture and moist-soil, and between cooperative and force account farming (Table 4).

The current share split agreement on the cooperative acreage is 80/20 in which the farmer retains an 80 percent share and the refuge retains the remaining 20 percent. Rice, corn, and milo are acceptable for refuge share; soybeans are not allowed to be taken for refuge share.

The current goal for the refuge is to provide approximately 12,000,000 DEDs through a combination of moist-soil, bottomland hardwood, and agricultural habitats. During most years, the majority of this goal can be realized from managed croplands contained on the refuge. For example, 300 acres of force account (un-harvested) milo (18,192 DEDs per acre) would provide 5,457,600 DEDs and 600 acres of cooperative farmed rice on an 80/20 share (139 DEDs per acre of harvested rice and 24,025 DEDs per acre of un-harvested rice) would provide 2,949,720 DEDs totaling 8,407,320 DEDs. However, this number can be substantially different from year-to-year since different crops and combinations will provide different levels of DEDs.

To meet Objectives 4.3.1, 4.3.2, and 4.3.3 in Management Units 1, 2, 3, 4, 5a, 5b, 5c, 5d, 9, 10, 11, 13, 14, 19, 20, 21, 22, 23, 26, and 27 for wintering waterfowl, the following management prescriptions will be used to manage cooperative farming:

- Annually meet with cooperative farmers to sign and review placement of crops and locations of refuge share.
- Maintain a minimum of 768 acres in crop production to provide a diversity of high-energy foods for waterfowl within flooded impoundments. Provide 357 acres of rice and 411 acres of milo/corn with the option to take shares in various combinations.
- Maintain a total of 100 to 300 acres of milo; possibly corn through force account (un-harvested) farming.

Table 4. Cropland total DEDs per management units on Grand Cote NWR

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DEDs
1	100	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post harvest, spring drawdown unless in moist- soil, then default to moist soil regime	13,900 up to 2,882,000
2	85	Force Account Farming Agriculture	Agriculture (rice, milo, corn) or moist- soil	Flood post harvest, spring drawdown unless in moist-soil, then default to moist-soil regime.	11,815 up to 2,449,700
3	35	Agriculture	Agriculture (rice, milo, corn) or moist- soil	Flood post harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	4,865 up to 1,000,870
4	35	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	4,865 up to 1,000,870
5A	34	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	4,726 up to 979,880
5B	34	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	4,726 up to 979,880
5C	16	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	2,224 up to 461,120
5D	16	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	2,224 up to 461,120

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DEDs
9	64	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	8,896 up to 1,844,480
10	56	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	7,784 up to 1,613,920
11	27	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	3,753 up to 778,140
19	53	Force Account Farming Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	7,367 up to 1,527,460
20	113	Force Account Farming Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	15,707 up to 3,256,660
21	147	Force Account Farming Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	20,433 up to 4,236,540
22	118	Force Account Farming Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist soil regime	16,402 up to 3,400,760
26	33	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist soil, then default to moist-soil regime	4,587 up to 951,060
27	33	Agriculture	Agriculture (rice, milo, corn) or moist-soil	Flood post-harvest, spring drawdown unless in moist-soil, then default to moist-soil regime	4,587 up to 951,060

MOIST-SOIL MANAGEMENT PRESCRIPTIONS

Moist-soil habitat management requires active management of soil and hydrology to promote productive and diverse stands of moist-soil plants. Management actions include draw down timing and duration, mowing, disking, or chemicals to keep units in early successional stages (Strader and Stinson 2005). Desirable moist-soil vegetation at Grand Cote NWR consists mostly of wild millet (*Echinochloa spp.*), Sprangletop (*Leptochloa spp.*), and panic grass (*Panicum spp*.), which germinate during mid-summer drawdowns. Other common beneficial plants include smartweeds, (*Polygonum spp*.), various sedges (*Carex and Cyperus spp*.), and duck potato (*Sagittaria latifolia*).

The impoundment should be flooded from late-September through early-October to provide water for migrating blue-winged teal, pintail, and shorebirds, and drawdowns should be conducted no later than July 15th (Strader and Stinson 2005). Ideal depths for foraging dabbling ducks are less than 12 inches; if water depths exceed 18 inches, food will be out of reach (Strader and Stinson 2005).

Prescribed fire control for moist-soil management will not be used, largely due to limits in sufficient management capability and resources.

To meet Objectives 4.4.1 and 4.4.2 in Management Units 15, 16, 17, 18, 21, 22, 24, 30, and 34 for wintering waterfowl, the following management prescriptions will be used to manage moist-soil habitat (Table 5).

- At a minimum of every 3 years, mow/plow impoundment to reduce succession by woody plants.
- Annually, place stop logs in water control structures in October to hold water or if not sufficient rainfall, pump water to achieve < 18 inches depth.
- If bayou is low enough to permit, begin drawdown in late-May/early-June.
- Monitor vegetation growth for percent cover of undesirable plants. If undesirables exceed 20 percent cover, manipulate vegetation through mechanical (i.e., mowing) or chemical means.
- Maintain records by date for water management actions, water elevations, and vegetation and wildlife responses.
- Use sampling techniques in Strader and Stinson (2005) to determine percent cover of plant species and seed production to determine if management actions need to be changed to meet objectives.
- Provide approximately 1,129,800 DEDs through providing 600 acres of managed moist-soil habitat.
- Vary drawdown rates to promote diversity of vegetative species.
- Time spring draw downs for the benefit of shorebirds.
- Manage water levels during growing season to provide for growth and germination of desirable plant species.

Table 5. Moist-soil/Bottomland/GTR total DEDs per management units on Grand Cote NWR

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DED Objective
6	15	Moist-soil	Moist-soil vegetation with water control capability.	Maintain early successional herbaceous vegetation, disk a minimum of every 3 years.	28,245
13	200	Moist-soil	Agriculture (rice, milo, corn) or moist-soil	Rotate every 1-3 years with agriculture crop. Soil disturbance by disking at a minimum of every 3 years. Flood October-May	376,600
14	117	Moist-soil	Agriculture (rice, milo, corn) or moist-soil	Rotate every 1-3 years with agriculture crop. Soil disturbance by disking at a minimum of every 3 years. Flood October-May	220,311
16	39	Moist-soil	Agriculture (rice, milo, corn) or moist-soil	Rotate every 1-3 years with agriculture crop. Soil disturbance by disking at a minimum of every 3 years. Flood October-May	73,437
17	78	Moist-soil	Agriculture (rice, milo, corn) or moist-soil	Rotate every 1-3 years with agriculture crop. Soil disturbance by disking at a minimum of every 3 years. Flood October-May	146,874
18	189	Moist-soil	Moist-soil vegetation with water control capability; can hold water, but only pull water off when Bayou Choctaw is not flooded.	Rotate plowing of entire unit every 3 years.	355,887
23	95	Moist-soil	Agriculture (rice, milo, corn) or moist-soil	Rotate every 1-3 years with agriculture crop. Soil disturbance by disking at a minimum of every 3 years. Flood October-May	178,855

Management Unit	Size (ac)	Habitat Type	Desired Condition	Treatment Plan	DED Objective
24	272	Moist-soil	70% black willow, 30% moist-soil	Flood November-May; disk 80 acres on a 3-year rotation.	512,176
30	80	Moist-soil	100% moist-soil	Disk at a minimum of every 3 years. Flood November-May/early June	150,640

REFUGE-WIDE MANAGEMENT STRATEGY PRESCRIPTIONS

Sanctuary

To meet Objectives 4.3.4 and 4.4.3 in Management Units 1, 2, 3, 4, 5a, 5b, 5c, 5d, 6, 9, 10, 11, 18, 19, 20, 21, 22, 24, 25, 26, and 27 for wintering waterfowl, the following management strategy will be used:

- Keep sanctuary boundary (Figure 6) posted and continue to enforce no waterfowl hunting in the sanctuary.

Exotic Invasive Plants

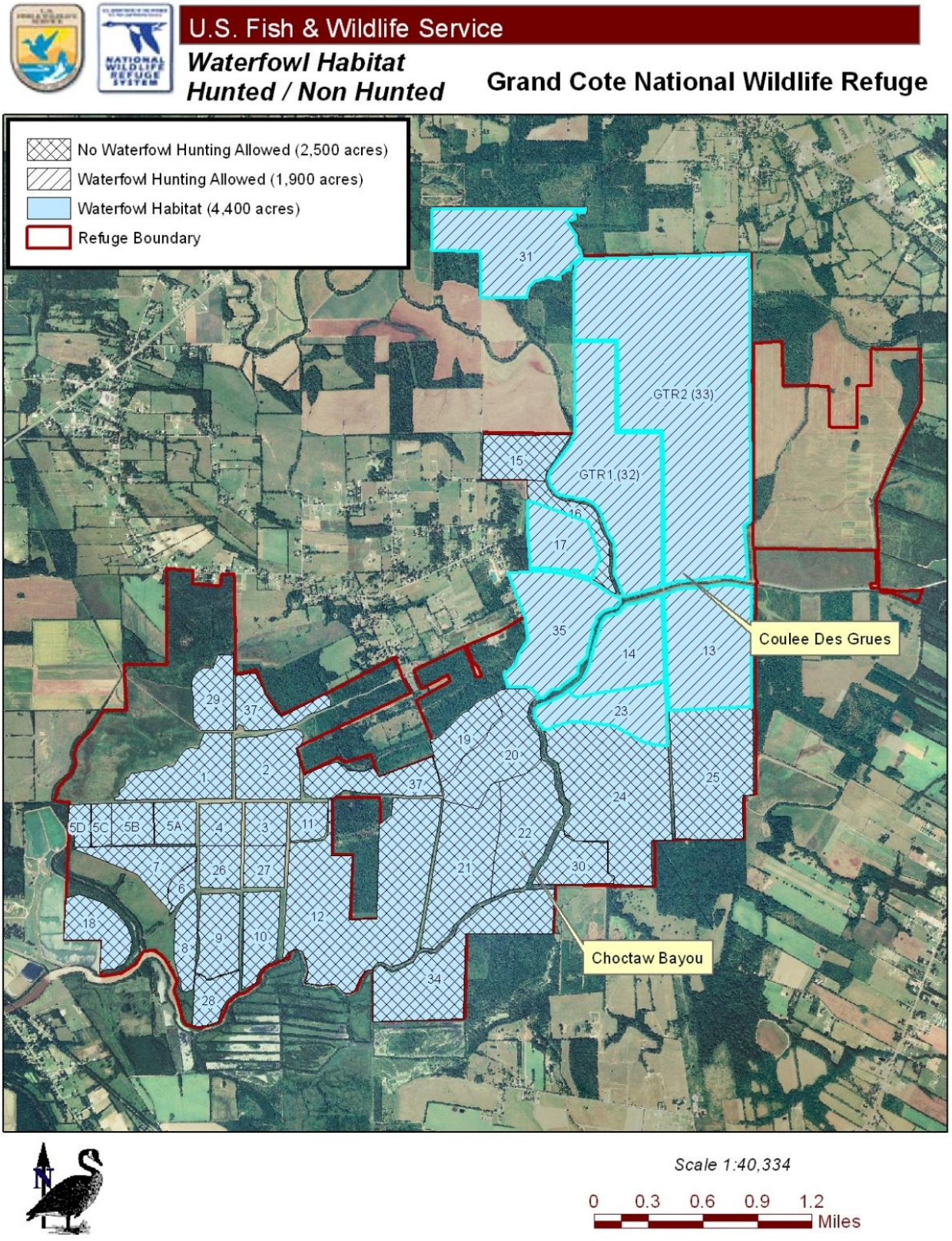
To meet all objectives in all management units for all resources of concern, the following strategies will be used to control exotic plants:

- GPS new areas of infestation by exotics annually.
- Treat Chinese tallow trees and other woody exotics once per year anytime except during leaf-out with 20 percent Element 4 with surfactant to trees > 8-inch dbh by cut-spray application. Treat trees < 8-inch dbh, but taller than 5 feet, with basal spray application 12-18 inches from ground. Treat trees shorter than 5 feet with a foliar spray of 5 percent glyphosate.
- If current process becomes ineffective, use an adaptive management process to find more efficient ways of treating invasives.

To meet Objective 4.4.1 in Management Units 15, 16, 17, 24, and 30 for wintering waterfowl, the following strategies will be used to control undesirable vegetation in moist-soil habitat:

- When red vine covers greater than 20 percent of management unit, treat with Peak herbicide after disking in late fall.
- When *Sesbania* covers greater than 20 percent of management unit, treat with 0.5-quart/acre of an appropriate herbicide before plants flower and/or reach 3 feet in height.
- Other undesirable plants, such as cocklebur and buttonbush, are to be treated with an appropriate herbicide when coverage exceeds 20 percent of management unit.
- If the unit is in crops, then appropriate methods will be utilized (i.e., plowing and/or chemical).

Figure 6. Waterfowl habitat on Grand Cote NWR



Exotic and/or Nuisance Animals

To meet Objective 4.1.1 in Management Units 32, 33, 2, 9, 10, 12, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 30, and 34 for nesting and resident wood ducks, bottomland hardwood forests, and wintering waterfowl, the following strategies will be used to control beaver damage in bottomland hardwood forests:

- When water recedes in spring/summer, inspect refuge for areas where water is not draining, including all areas known to have beaver dams in the past.
- GPS locations of all beaver dams for future reference.
- Determine best method for removal of located dams and remove immediately.
- During winter when refuge is flooded, remove beavers.
- If time permits, set traps for beavers.

To meet Objectives 4.3.1, 4.3.2, 4.3.3, and 4.4.1 in Management Units 1, 2, 3, 4, 5a, 5b, 5c, 5d, 9, 10, 11, 13, 14, 19, 20, 21, 22, 23, 24, 25, 26, 27, 30, and 34 for cropland, the following strategies will be used to control feral hog damage in bottomland hardwood forests:

- Inspect the refuge/cooperative farming units and locate areas that have increased feral hog activity.
- Transport and set hog traps.
- Determine best method for removal and remove immediately.
- During winter when refuge is flooded and food is scarce, increase efforts to remove hogs from the refuge through shooting.
- If time permits, obtain funding for building additional traps.
- No hogs will be released or removed alive from refuge lands.

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Appendix A. Environmental Action Statement

U. S. FISH AND WILDLIFE SERVICE
ENVIRONMENTAL ACTION STATEMENT FOR CATEGORICAL EXCLUSION

Within the spirit and intent of the Council on Environmental Quality's regulations for implementing the National Environmental Policy Act (NEPA), and other statutes, orders, and policies that protect fish and wildlife resources, I have established the following administrative record and determined that the following action is categorically excluded from NEPA documentation requirements consistent with 40 CFR 1508.4, 516 DM 2.3A, 516 DM 2, Appendix 1, and 516 DM 6, Appendix 1.4.

Proposed Action and Alternatives. The action is the approval and implementation of the Habitat Management Plan (HMP) for Grand Cote National Wildlife Refuge (NWR). This HMP is a step-down management plan providing the refuge manager with specific guidance for implementing goals, objectives, and strategies identified in the Grand Cote NWR Comprehensive Conservation Plan (CCP).

The CCP action was the preferred alternative among three alternatives considered in the Environmental Assessment (EA). In the CCP, the action was to "Restore and Improve Ecological Diversity and Augment Visitor Services." Implementing the preferred alternative will result in the restoration and improvement of refuge resources needed for wildlife and habitat management, while providing opportunities for a variety of additional compatible wildlife-dependent recreation, education, and interpretive activities. This action will also allow the refuge to provide law enforcement protection that adequately meets the demands of an urban environment.

The CCP has defined goals, objectives, and strategies to achieve the stated action. The actions further detailed in the HMP have been identified, addressed, and authorized by the Grand Cote NWR CCP. These include:

Bottomland Hardwood Habitat Goal

Protect, restore, and manage healthy bottomland hardwood habitat to support viable populations of native flora and fauna consistent with sound biological principles and other objectives of this HMP.

Objective 1.1
In Management Units 31, 32, 33, and 25*, provide a functioning greentree reservoir (GTR) by implementing a variable flooding regime, which mimics natural regimes by flooding units from late-November through at least the end of January, to favor a diversity of species. Provide that no flooding will occur approximately once every 5 to 7 years. Due to the young age of these forested units, regeneration is a not a concern within the next 15 years. The focus is primarily on survival. However, long-term strategies should include a combination of silviculture methods utilized to meet uneven-aged forest management objectives, including thinning, small patch/clear-cuts, etc., that will eventually mimic old-growth forest conditions.

Objective 1.2
In Management Units 7, 8, 28, and 29, monitor reforested stands of native deciduous bottomland species for 50:50 ratio of hard and soft mast species production. These seedlings were planted on 12-foot X 12-foot spacing at a density of 302 seedlings per acre.

Objective 1.3
In Units 31, 32, and 33, provide a basal area of 60-70 feet2/acre and the over-story canopy should be approximately 60-70 percent, to allow adequate sunlight to stimulate the growth of mid- and under-story structures for enhanced wildlife habitat.

Objective 1.4
In Management Units 32, 33, 12, 24, 25, and 34, promote the growth of native under-story vegetation by providing forested habitat containing < 5 percent exotic invasive vegetation (e.g., Chinese tallow, Chinese privet, and trifoliate orange).

Objective 1.5
In Management Units 15, 16, 17, 24, 25, 31, 32, and 33, maintain 100 nest boxes for wood ducks.

Forested Upland Habitat Goal
Protect and manage upland forested areas to promote the biological integrity, diversity, and ecological health of the refuge and the surrounding landscape.

Objective 2.1
In Management Units 35 and 36, passively manage 273 acres of mixed pine-hardwood forest to provide an upland refugium for terrestrial wildlife during flood events and enhance visitor services at the refuge by providing hunting opportunities.

Waterfowl Impoundments–Cropland Habitat Goal
Manage water level and crop production of high-carbohydrate (hot) cereal grain plants on 1,400 acres of cropland habitat to provide food resources for migrating and wintering waterfowl to achieve the North American Waterfowl Management Plan (NAWMP) step-down objectives for Louisiana.

Objective 3.1
In Management Units 13, 14, and 23 (412 combined acres), provide 775,796 DEDs (moist-soil) up to 11,845,020 DEDs (un-harvested corn) through planting of crops and then flooding from late-November to late-February. Also provide shallow mudflats 3 to 4 inches in depth for shorebird use.

Objective 3.2
Provide 49,623 (harvested rice) to 10,288,740 (un-harvested corn) DEDs in Management Units 1, 3, 4, 5a, 5b, 5c, 5d, 11, 26, and 27 (363 acres combined), through farming of crops to be flooded from late-November to late-February. Provide shallow water conditions (3 to 4 inches) during rice planting to benefit shorebirds.

Objective 3.3
In Management Units 2, 9, 10, 19, 20, 21, and 22 (636 acres combined), provide 5,457,600 up to 8,646,000 DEDs, through farming of 300 acres of crops to be flooded from late-November to late-February, using refuge staff and resources; the remainder of these units will be either moist-soil or cooperative farmed, resulting in DEDs of 46,704 to 1,197,588. These fields are not level enough for rice production.

Objective 3.4
Maintain 2,500 acres of refuge as waterfowl sanctuary and use adaptive management for yearly regulations, delineations, and modifications.

Waterfowl Impoundments–Moist-soil Habitat Goal
Manage moist-soil habitat to promote natural herbaceous wetland vegetation beneficial to wintering waterfowl to achieve the NAWMP step-down objectives for Louisiana.

Objective 4.1
Provide 1,129,800 DEDs utilizing a total of 600 of 988 acres within Management Units 13, 14, 15, 16, 17, 18, 21, 22, 23, 24, and 30. Manage water drawdown rates and disk and/or apply herbicide as needed to control nuisance vegetation and promote desirable wetland vegetation.

Objective 4.2
In a total of 988 acres within Management Units 15, 16, 17, 18, 21, 22, 24, and 30, manage water levels during the winter and early spring to maximize availability of food and cover resources (e.g., moist-soil, milo, corn, and rice), including both vegetation and invertebrates.

Strategies
The following strategies will be used as appropriate to conduct habitat management to meet objectives under this HMP:

- Moist-soil Management (i.e., water control, mechanical control, chemical control, crop farming)
- Crop Management (i.e., cooperative farming, force account farming)
- Chemical Management
- Greentree Reservoir Management (i.e., water management)
- Waterfowl Sanctuary Management
- Population Management (i.e., beaver management, feral hog management, wood duck box management)

Categorical Exclusion(s). Categorical Exclusion Department Manual 516 DM 6, Appendix 1, Section 1.4 B (10), which states *"the issuance of new or revised site, unit, or activity-specific management plans for public use, land use, or other management activities when only minor changes are planned. Examples could include an amended public use plan or fire management plan"* is applicable to implementation to the action in this HMP.

Consistent with Categorical Exclusion (516 DM 6, Appendix 1, Section 1.4 B (10)), this HMP is a step-down management plan which provides guidance for implementation of the general goals, objectives, and strategies established in the CCP, serving to further refine those components of the CPP specific to habitat management. This HMP does not trigger an Exception to the Categorical Exclusions listed in 516 DM 2, Appendix 2.

Minor changes or refinements to the CCP in this activity-specific management plan include:

- Habitat management objectives are further refined by providing numerical parameter values that more clearly define the originating objective statement.
- Habitat management objectives are restated so as to combine appropriate objectives or to split complicated objectives for improved clarity in the context of this HMP.
- Specific habitat management guidance, strategies, and implementation schedules to meet the CCP goals and objectives are included (e.g., location, timing, frequency, and intensity of application).
- All details are consistent with the CCP and serve to provide the further detail necessary to guide the refuge in application of the intended strategies for the purpose of meeting the habitat objectives.

Permits/Approvals. Endangered Species Act, Intra-Service Section 7 Consultation was conducted during the CCP process for Grand Cote NWR.

Section 7 consultation identified the following effects on listed species and critical habitats on Grand Cote NWR:

SPECIES/ CRITICAL HABITAT	IMPACTS TO SPECIES/CRITICAL HABITAT
Louisiana Black Bear	No negative impacts foreseen, more protection
Bald Eagle	No negative impacts foreseen, more protection
Interior Least Tern	No negative impacts foreseen, more protection

The following actions were identified, and incorporated into this HMP, to reduce adverse effects:

SPECIES/ CRITICAL HABITAT	ACTIONS TO MITIGATE/MINIMIZE IMPACTS
Louisiana Black Bear	Participate in recovery efforts by supporting repatriation efforts on Grand Cote NWR
Bald Eagle	Maintain and expand potential roosting and feeding habitat
Interior Least Tern	Work with Corps of Engineers and private landowners to maintain sandbar habitat along the Red River

The Service's Louisiana Ecological Services office determined that in the case of the Louisiana black bear and the bald eagle that the actions specified were not likely to adversely affect. This determination is appropriate when the action is not likely to adversely impact any listed, proposed, candidate species or designated/proposed critical habitat or there may be beneficial effects to these resources. They further determined in the case of the interior least tern that the actions specified would have no effect. This determination is appropriate when the action will not directly, indirectly, or cumulatively impact, either positively or negatively, any listed, proposed, candidate species or designated/proposed critical habitat.

SPECIES/ CRITICAL HABITAT	DETERMINATION[1]			RESPONSE[1] REQUESTED
	NE	NA	AA	
Louisiana Black Bear		X		
Bald Eagle		X		
Interior Least Tern	X			

Public Involvement/Interagency Coordination.

In preparation for developing the CCP for Grand Cote NWR, a Wildlife and Habitat (Biological) Review was conducted during the week of October 20-22, 2003, by a team of Service biologists, managers, foresters, and non-Service managers/biologists. The Biological Review was completed in February 2004. A Visitor Services Review was completed in November 2003. To expand the range of issues and generate potential alternatives, public input to the development of the CCP was initiated through two public scoping meetings held on March 9 and 11, 2004, at Marksville and Bunkie High Schools, Avoyelles Parish, Louisiana. At the meetings, interested stakeholders were able to register their concerns to ensure that they would be considered in the development of the CCP. The meetings were publicized by a press release in the local papers in cities of Alexandria, Marksville, Ville Platte, Jena, Bunkie, and Lafayette, Louisiana, and were broadcasted on two local radio stations. There were 19 attendees at the meetings, and several meeting attendees provided public comments. One citizen sent a comment letter to the refuge.

Supporting Documents. Supporting documents for this determination include relevant office file material and the following key references:

Comprehensive Conservation Plan for Grand Cote NWR (USFWS 2006).

Habitat Management Plan for
Grand Cote National Wildlife Refuge

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May 2013